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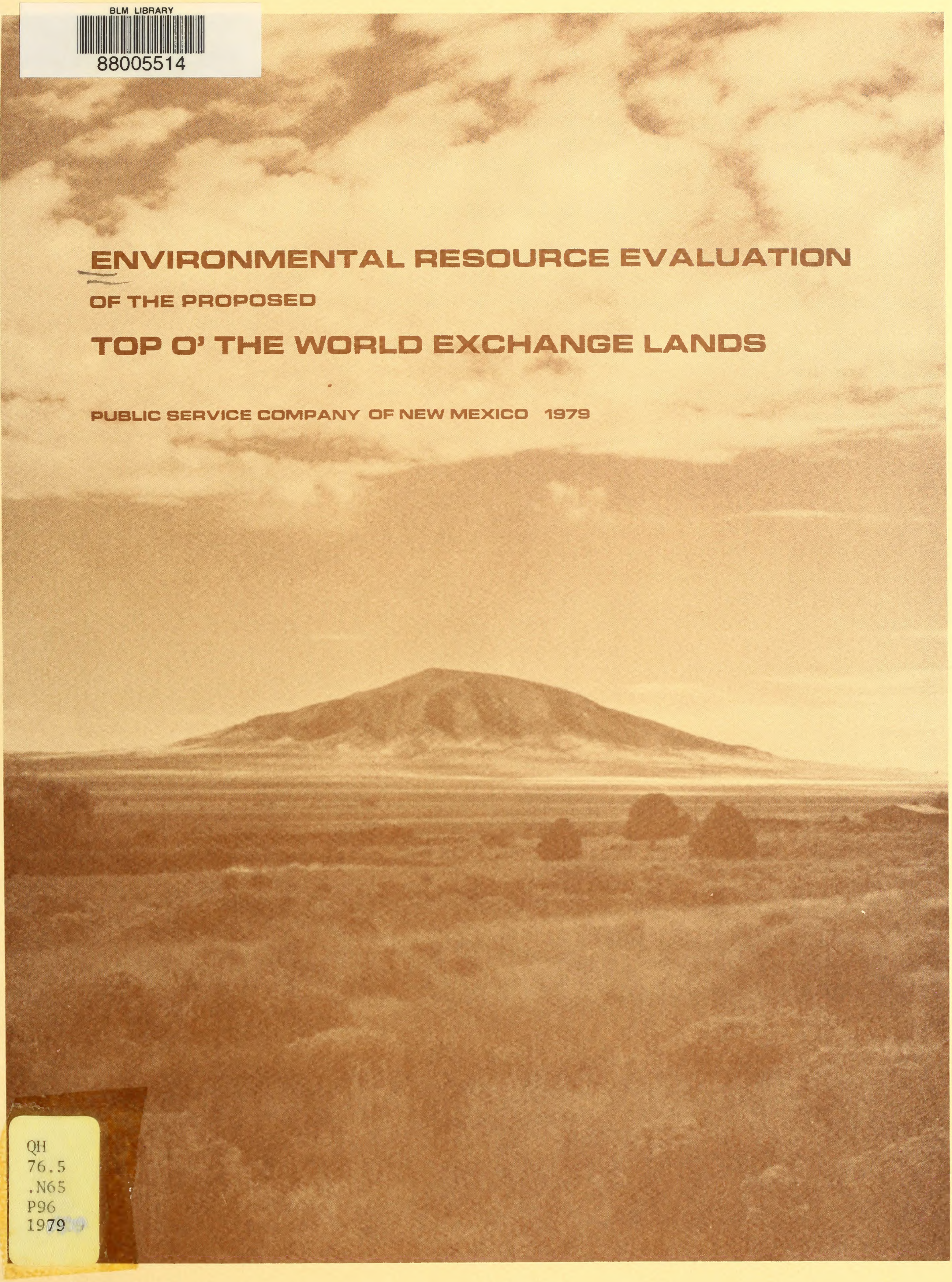

# ENVIRONMENTAL RESOURCE EVALUATION

OF THE PROPOSED

# TOP O' THE WORLD EXCHANGE LANDS

PUBLIC SERVICE COMPANY OF NEW MEXICO 1979

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# TOP O' THE WORLD
# EXCHANGE LANDS
# RESOURCE EVALUATION

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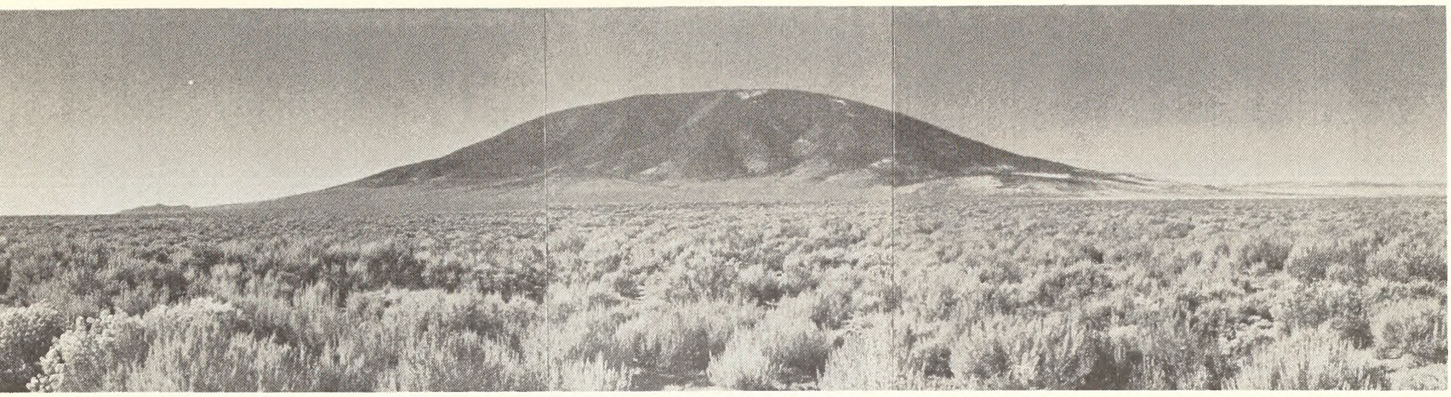
## 1.0 INTRODUCTION

The following report was prepared by personnel of the Environmental Affairs Department of the Public Service Company of New Mexico (PNM) for the Bureau of Land Management (BLM), Albuquerque District Office. The report is intended to provide an evaluation of relevant environmental resources as they presently exist at the proposed Top o' the World Exchange Lands, a property owned by PNM and Franklin Land and Resources Company (a subsidiary of El Paso Electric Company) as co-tenants. A proposal has been made to effect an exchange of lands between the co-tenants and the BLM which would involve exchanging approximately 19,888 acres for lands of equivalent appraised value owned by BLM in the Bisti area of northwest New Mexico. Prior to concluding such an exchange, BLM is required to perform a feasibility study covering both the offered and selected exchange lands. Due to time constraints and a shortage of available manpower, BLM agreed to have PNM conduct studies designed to fulfill this requirement on the offered lands.

The study effort was guided by BLM, and the report is subject to their sole scrutiny as to adequacy; the report was prepared according to a partial Land Report outline from the BLM Manual (Supersedes Rel. 2-65), Rel. 2-137, April 8, 1977.

PNM wishes to acknowledge the guidance received in preparing the report from Messrs. Bob Muller and Ben Phillips, BLM's Albuquerque District Office, and the cooperation and insight provided by Messrs. Richard Niemeyer, Ben Kuykendall, Dickie Speegle, Darrell Musick, and John Foster of the BLM's Taos Resource Area Office.

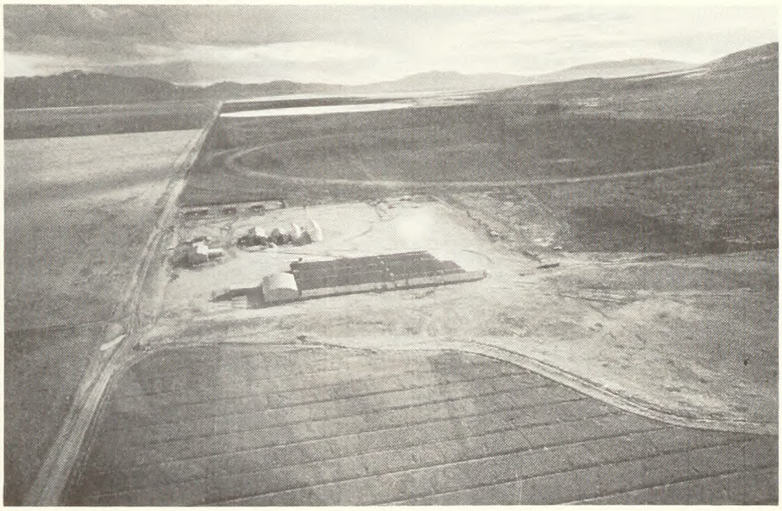
The proposed exchange lands contain a variety of interesting and varied environmental resources. The following photo section provides a clear indication of the quality and extent of these resources, and illustrates typical conditions as found on and near the proposed exchange lands.

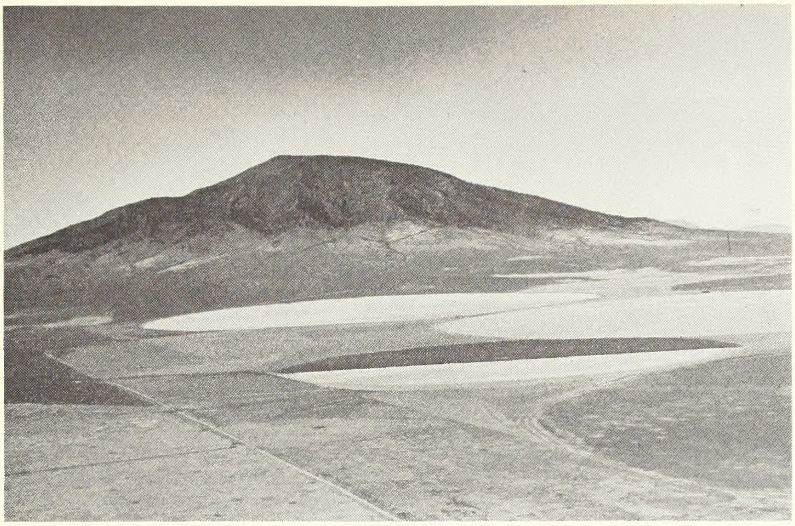


Ute Mountain dominates the landscape of the proposed Top o' the World exchange lands. This remnant of a volcano projects through alluvium washed down from the Sangre de Cristo range to the east. The view is from the northeast.

One of several access points to the proposed exchange lands is provided by this county maintained road (B-051).

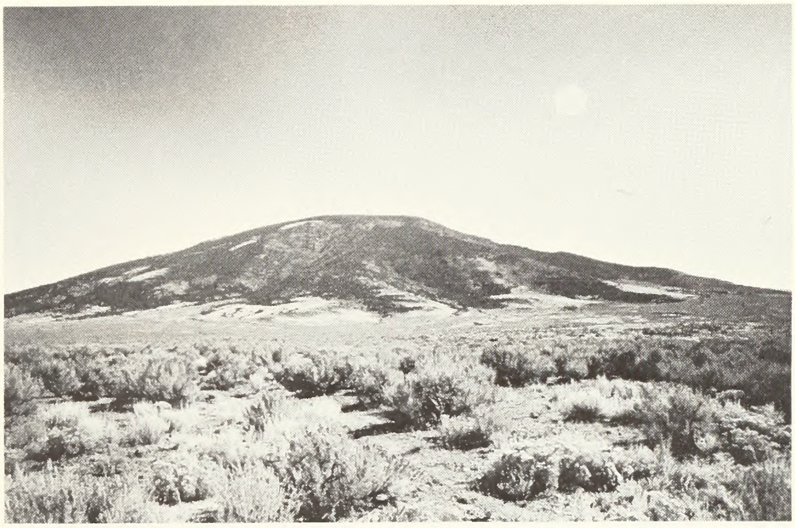
Top o' the World Farms lies to the east of Ute Mountain, adjacent to the exchange lands. Portions of these irrigated lands are seen in this view to the south. The Sangre de Cristos are evident in the background.

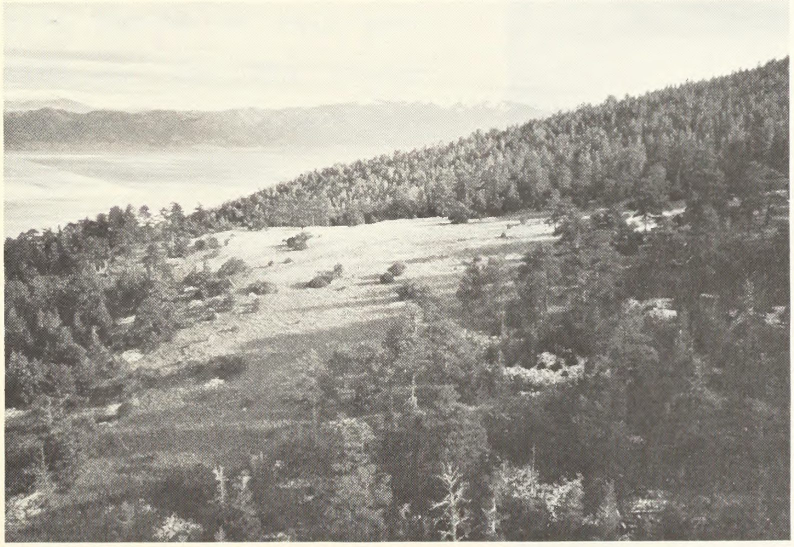




Visual resources of the exchange lands include interesting contrasts between the level chalky-green alluvial plain, the dark grey-green conifered peak, and the light and dark geometric forms of the adjacent farmlands.

This photo of the southwestern side of the mountain is representative of the sagebrush-grassland surrounding the grassy lower flanks of Ute Mountain.

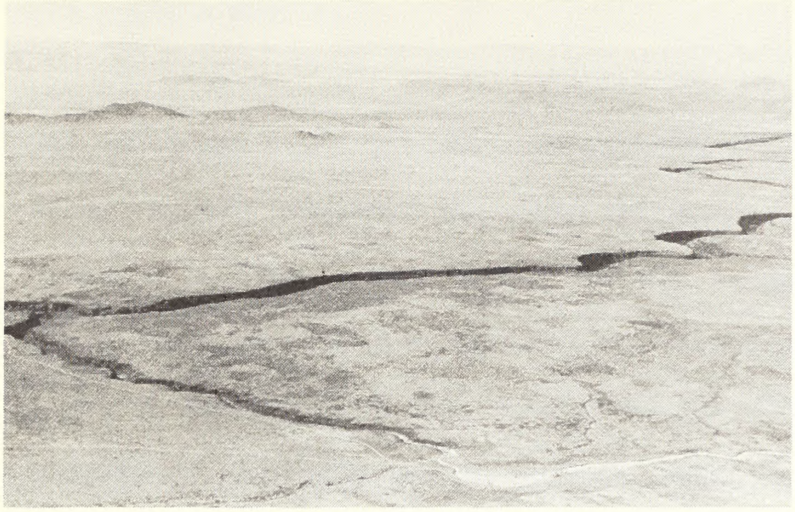




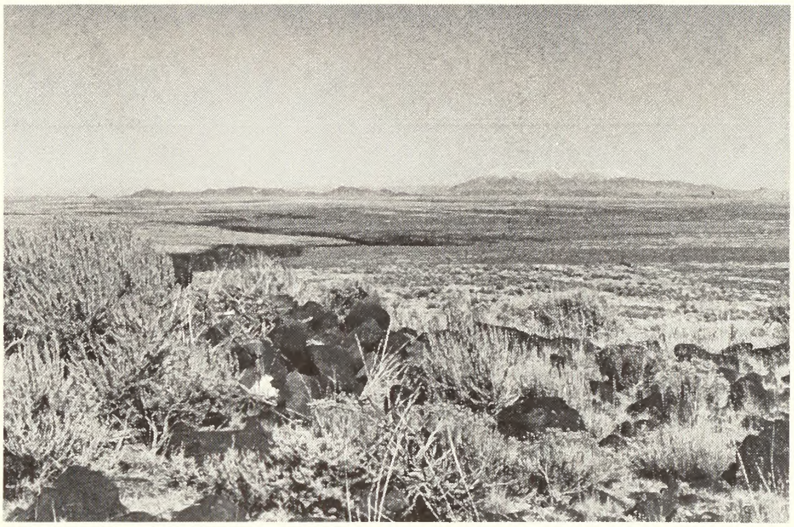
Coniferous forests interspersed with meadows which provide habitat for deer and elk cover the upper portion of the mountain. The broad alluvial plain at the base of the Sangre de Cristo Mountains appears in the background.

Looking to the south from the top of Ute Mountain, one has a clear view across the southern part of the Sunshine Valley to Cerro Chiflo (left), Cerro de la Olla (right), and an unnamed peak (middle). The Rio Grande gorge cuts diagonally across the picture.

The steep basaltic walls of the gorge, carved by the river, provide a nesting place for many species of birds. The wild beauty of this portion of the Rio Grande attracts many river running enthusiasts.



Costilla Creek flows into the Rio Grande from the northeast. It makes a sharp 120 foot descent through the plateau which provides access to the river and the gorge. This view shows the extreme northwestern portion of the exchange lands.



The exchange lands contain several archeological sites, including this basalt structure base located on a small rise west of the mountain. The view is north into Colorado, with Blanca and Little Bear Peaks on the skyline.

## 2.0 AREA ANALYSIS

The exchange lands are located entirely within Taos County, New Mexico, as shown on the regional area map (Figure 2.1). The western boundary of the property is the centerline of the Rio Grande; the northern boundary is the state line between New Mexico and Colorado; the southern boundary is the southern boundary of the defunct Sangre de Cristo Land Grant; the eastern boundaries are adjacent to private lands. The nearest communities are the towns of Costilla, New Mexico, located along New Mexico highway (NM)-3 approximately 2 miles east of the exchange lands and Jaroso, approximately 0.5 miles north of the property line in Costilla County, Colorado.

The property is located in Sunshine Valley, an extensive, elongated, relatively flat piedmont plain devoted primarily to agriculture and livestock grazing. The valley extends from the confluence of Red River and the Rio Grande near Questa, New Mexico, well into southern Colorado.

### 2.1 Physiographic Features

The following is largely taken from Technical Report No. 12 of the New Mexico State Engineers Office (Winograd 1959).

The regional study area is physiographically composed of two prongs of the Southern Rocky Mountains with a basin in between. The eastern prong is the Sangre de Cristo Range and extends south to Santa Fe. The west prong consists of the San Juan, Conejos, and Jemez mountains, which extend south to Jemez Pueblo in New Mexico. The Rio Grande flows in the depression between these highlands. In Taos County this basin is called the Rio Grande trough and ranges from 12 to 33 miles wide. The basin's eastern edge is marked by the western scarp of the Sangre de Cristos while the western edge has a more gradually increasing slope and hence is less defined. Within the area, the Rio Grande flows in a canyon cut into the lava covered plateau; the canyon begins about six miles north of the Colorado state line and gradually deepens until, at Embudo, New Mexico, about three miles south of the southern Taos County line, the canyon is about 1,200 feet deep. Within the area of the exchange lands, the canyon is about 120 feet deep.

In the area of Sunshine Valley and the exchange lands, three prominent landforms occur: (1) piedmont alluvial plain, (2) a lava-capped plateau, and (3) fault block mountains.

The piedmont plain is generally known as the Sunshine Valley, and is located between the Rio Grande and the Sangre de Cristo Mountains. The valley is a sloping plain formed at the base of sharp mountains and underlain largely by detritus from the mountains which has been deposited in coalescing alluvial fans. This type of land form is common in New Mexico.

Ute Mountain, an extinct volcano, rises above the plain in the northwest segment of the valley. The mountain rises to 10,093 feet from an elevation of about 7,600 feet at its base. The altitude of the plain ranges from about 7,800 feet near the mouth of Costilla Creek where it emerges from the Sangre de Cristos to 7,500 feet at the rim of the Rio Grande gorge at the southern end of the exchange lands. From Costilla Creek near Costilla, NM, the valley slopes westerly toward the Rio Grande gorge at 25 to 100 feet/mile.

# REGIONAL AREA

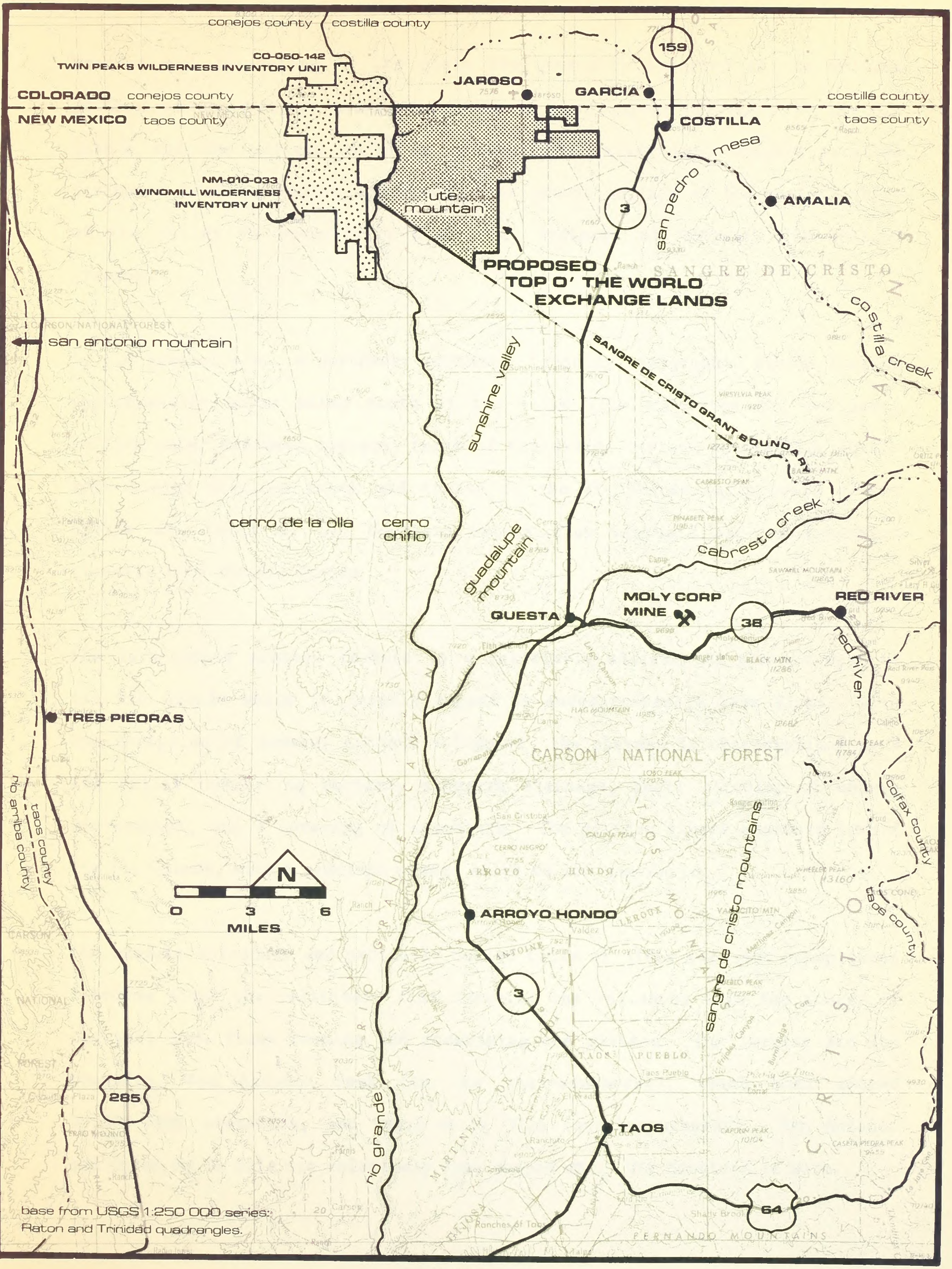


FIGURE 2.1

Erosion and channeling of the plain has generally occurred in the western portion of the valley; headward erosion of box canyons tributary to the Rio Grande cut the western third or more of the valley into roughly parallel southwest trending ridges and draws. The smooth surface of the eastern third of the valley is essentially unaltered; drainage is westerly via shallow arroyos.

In the general area, a northwest-southeast trending topographic divide located approximately three miles south of the state line separates the two local surface water drainage systems; north of the divide surface waters flow northwest toward Costilla Creek and thence to the Rio Grande while south of the divide and south of Ute Mountain waters flow westward and southwestward directly into the Rio Grande.

The lava-capped plateau feature is a relatively undissected plateau west of the Rio Grande which is largely capped by andesite-basalt lava flows. With the exception of several extinct volcanoes, the plateau is characterized by a low relief undulating surface, sluggish drainage, small circular or oblong depressions, and a covering of sagebrush. The plateau slopes eastward toward the Rio Grande, with a gradient change of 40 to 100 feet/mile.

The extinct volcanoes and partially buried hills of older rock are conspicuous features above the relatively flat terrain; the volcanoes were the source of the vast lava flows forming and underlying the plateau. The largest are Ute Mountain, San Antonio Peak (to the west-southwest), which both exceed 10,000 feet elevation, and Cerro de la Olla (south-southwest). San Antonio and Cerro de la Olla are relatively dome shaped while Ute Mountain is more conical. The difference in shape may be due to the extrusion of higher viscosity lavas from Ute Mountain.

The Sangre de Cristo Mountains, one of the most prominent ranges in New Mexico, comprise the eastern boundary of Sunshine Valley. Within the state, the range is about 95 miles long north to south and 12 to 30 miles wide, with several peaks in excess of 12,000 feet. The western boundary is a fault scarp as evidenced by the bold western face of the mountains, fault scarplets at canyon mouths, and extensive talus at the foot of the range. All of the perennial streams in the area, with the exception of the Rio Grande, originate in these mountains and flow westward toward the valley. Costilla Creek, Cabresto Creek, and Red River are the major streams, with several smaller streams flowing from the highlands; all lose water to the permeable valley fill upon emerging from the mountains.

## 2.2 Social Factors

Populations in the general area are centered in the major towns of Taos, Questa, and Costilla along NM-3, and Tres Piedras and Ojo Caliente along US-285 in the western portion of Taos County. Taos County in general is rather sparsely populated; in 1975, the county had a total population of 19,300 persons living on 2257 square miles (density of 8.6 persons/square mile). Taos and Questa had 1974 populations of 3,050 and 1,125 respectively. Major Indian groups living in the county are composed of the Picuris and Taos Pueblos (1970 populations of 90 and 1,049 respectively). All county residents were classified as rural dwellers in the 1970 census; 86.3 percent were of Spanish heritage and 6.8 percent of Indian descent. Persons 65 or older accounted for 9.3 percent of the county's 1970 population, 34 percent higher than the state's average of 6.9 percent. Between 1970 and 1975, Taos County grew from 17,500 persons to 19,300, incurring a net population in-migration of 660 new persons in addition to a natural increase of 1,140 persons (BBER 1977).

Major transportation systems serving the county are limited. Two US highways run through the county: US-285 traverses the western portion of the county, connecting the Santa Fe-Espanola area with Alamosa, Colorado; US-64 connects Taos via Eagle Nest with Raton and U.S. Interstate 25 to the east, and Santa Fe to the south. The rest of the county is served by several state highways and numerous county roads. The primary road link in the region of the exchange lands is NM-3, a two lane asphalt road which connects Taos, Questa, and Costilla with San Luis, Colorado, to the north. Average daily traffic (ADT) along NM-3 is highly variable, depending on where the measurement is taken; ADT for 1978 near the exchange lands was about 1,000 vehicles, as shown on Figure 3.9 (McClenahan 1979). According to a 1974 traffic survey on NM-3 at the Colorado state line, 65 percent of all vehicles counted were passenger cars, 20 percent pickup trucks, and 15 percent busses and commercial tractor/trailers; 30 percent of all passenger and light truck vehicles were registered out-of-state (McClenahan 1979). The only other roads of significance in the general area are NM-196 which links Costilla with Amalia to the east (no ADT data available), and NM-516 linking Costilla and Garcia, Colorado (Figure 3.9). The largest airport in the region is at Taos, although the municipally owned 5,000 feet paved runway airport has no scheduled commercial activity (NMISC 1975). Other small private airports or landing strips are scattered throughout the region although there are none in the vicinity of the exchange lands.

Major utility corridors passing through or near the property are very limited. Kit Carson Electric Cooperative operates a 69 kV electric transmission line into the area; the line follows NM-3 north (on the east side of the road), providing power into Costilla, Amalia, and the general area. The immediate area receives electric service from Kit Carson at 4200 volts; several lines cross the area providing service for farm and household use and to power irrigation pumps (Kit Carson Electric Cooperative 1979).

Amenities within the general area are essentially natural ones; the natural beauty of the surrounding mountains and pastoral qualities of the valley, retention of a well established style and pace of life, and the general culture and cohesion of Hispanic ethnic solidarity provide the major social amenities.

Land uses in the area are generally limited, with agriculture and livestock grazing being major uses. Small areas of the Sunshine Valley on the east side of the Rio Grande are irrigated. In the general area of the proposed exchange lands, Costilla Creek provides the main source of water for surface irrigation; surface water irrigation is generally limited to the east of the exchange lands in areas immediately surrounding Costilla, along Costilla Creek to the north, and several small farms bordering NM-3. Irrigators along this system are organized into an Irrigation District operated by the Rio Costilla Cooperative Livestock Association. Loss of much of the water from the irrigation ditches to the underlying coarse valley fill limits the potential for expanding this type of irrigation in the general area.

Locally, several of the larger farms rely on groundwater for irrigation. Due to shallow soils and the difficulty of providing correctly sloped and smoothed fields, gravity flood-type irrigation is not extensively used on larger farms; rather, large circular sprinkler rigs are the norm.

Timber harvesting from stands in the Sangre de Cristo Mountains and lumber processing is also a major land use. A large lumber mill is located north of Amalia, while several much smaller sawmill operations are scattered throughout the area, including one located on NM-3 just four miles east of the property.

Other major land uses are wildlife habitat, and outdoor recreation; a major recreational resource is a section of the Rio Grande running from the Colorado border to the Taos Junction bridge. This portion of the river is classified as a Wild River under the 1968 Wild and Scenic Rivers Act, and is administered by the BLM. Mining also occurs in the region, including gravel, perlite, and molybdenum production (NMEMD 1978). All mining is relatively remote from the exchange lands except for a small gravel operation on NM-3. Molybdenum is by far the most economically significant mineral produced in Taos County, with all production located east of Questa, approximately 20 miles south of the property. The value of all mineral production in Taos County for 1973 totalled $21.6 million (BBER 1977). A more complete description of area land uses as they relate to the exchange lands is given in sections 3.1, 3.6, and 3.7.

Land ownership patterns in the general area are somewhat typical of New Mexico. The Sunshine Valley area east of the Rio Grande from Questa extending north into Colorado is largely in private ownership, as is an extensive area of eastern Taos County east of the exchange lands; this area is mainly composed of lands once contained in the Sangre de Cristo Land Grant. In the New Mexico portion of Sunshine Valley, the BLM and the state of New Mexico control extensive tracts along the Rio Grande from the southern property line south to the Red River near Questa. The U.S. Forest Service controls large tracts of southeastern Taos County south of the Sangre de Cristo Land Grant boundary in the Carson National Forest. West of the Rio Grande, land ownership patterns are a checkerboard of BLM, state, and private lands.

A major land use trend of the past two decades has been the platting of range or farmland into housing subdivisions. Many thousands of acres in the Sunshine Valley, especially in southern Colorado have been platted into lots and sold to the public for vacation or retirement "ranchitos."

## 2.3 Economic Factors

Taos County and the entire northern New Mexico region has long been an economically depressed area. Taos County has a current unemployment rate of 10.2 percent among the 8,686 member labor force, considerably above the 6.5 percent state average (NMESD 1979). Like most northern New Mexico counties, there are not enough jobs for the residents. Once agriculture was able to provide a living and sustain many of the regional inhabitants; however, the decline of agriculture has not been replaced for many, especially among Hispanics who have a deep seated attachment to the land and their rural agriculturally-based way of life. Historically, small farms and livestock grazing, especially in the Carson National Forest and public domain lands, kept agriculture preeminent. Agriculture has since diminished in importance due to the overall acreage reduction of commercial farms, inadequate or nonexistent processing plants for local crops and livestock, reduction of grazing permits on government lands, and overgrazing (NMISC 1975). A significant factor has been the reduction in acreage of more marginal operations due to the Spanish custom of equally dividing land among inheriting children; this type of land division has made most small farms uneconomical and the majority are now used merely to supply the owner with enough produce for personal consumption (NMISC 1975). The number of working farms in Taos County declined from 610 to 1964 to 178 in 1969. At the same time, the average acreage per farm increased from 590 acres to 1,136 acres (BBER 1977). The result is a reduction of acres devoted to agriculture from 359,900 acres in 1964 to 202,200 acres in 1969. The value of Taos County's agricultural products sold also dropped, from $882,000 in 1964 to $844,000 in 1969, although the average income per farm increased from $1,146 to $4,740 over the same period (BBER 1977).

Growth sectors in the regional economy have been mining (primarily molybdenum), tourism, and government at all levels. These trends are indicated in terms of employment and income sources for Taos County, as shown in the following tables.

## TABLE 2.3-1
## EMPLOYMENT BY INDUSTRY, TAOS COUNTY
## 1974

| | number | percent |
|---|---|---|
| Total employment | 5,893 | 100.0 |
| Total nonagricultural wage and salary | 4,572 | 77.6 |
| Manufacturing | 226 | 4.9 |
| Mining | w* | - |
| Contract construction | 291 | 6.4 |
| Transporation, communication, and public utilities | 105 | 2.3 |
| Wholesale and retail trade | 871 | 19.1 |
| Finance, insurance, and real estate | 154 | 3.4 |
| Services and miscellaneous | 1,813 | 39.7 |
| Government | 1,112 | 24.3 |

w - withheld

*66th Annual Report, New Mexico Department of Energy and Minerals, Bureau of Mine Inspection lists 293 mine employees in 1978.

Source: BBER 1977

## TABLE 2.3-2
## EMPLOYMENT BY MINORITY STATUS, TAOS COUNTY
## 1970

| | labor force | employed | unemployed | |
|---|---|---|---|---|
| | | | number | rate |
| Total | 4,874 | 4,466 | 408 | 8.4 |
| Percent of Total | | | | |
| White[1] | 95.0 | 95.0 | 95.1 | 8.4 |
| Black | -- | -- | -- | -- |
| Other[2] | 5.0 | 5.0 | 4.9 | 8.2 |
| Spanish surnamed[3] | 50.6 | 50.2 | 53.5 | 8.9 |

[1] Includes Spanish surnamed

[2] Includes Native Americans

[3] Includes people of all racial affiliations

Source: BBER 1977

## TABLE 2.3-3
## TOTAL LABOR AND PROPRIETORS INCOME, TAOS COUNTY
## 1972 and 1974

| | 1972 | | 1974 | |
|---|---|---|---|---|
| | (000's) | percent | (000's) | percent |
| Farm | $ 774 | 2.6 | $ 454 | 1.2 |
| Nonfarm | 28,843 | 97.4 | 35,943 | 98.8 |
| Private | 20,705 | 71.8 | 26,297 | 73.2 |
| Manufacturing | 765 | 2.7 | 1,133 | 3.2 |
| Mining | w | - | w | - |
| Contract construction | 1,554 | 5.4 | 2,407 | 6.7 |
| Wholesale and retail trade | 4,900 | 17.0 | 5,797 | 16.1 |
| F.I.R.E. | 864 | 3.0 | 1,108 | 3.1 |
| Transportation, communication, and utilities | 821 | 2.8 | 1,128 | 3.1 |
| Services | 5,414 | 18.8 | w | - |
| Other | w | - | 72 | 0.2 |
| Government | 8,138 | 28.2 | 9,646 | 26.8 |
| Federal | 2,318 | 8.0 | 2,901 | 8.1 |
| State and local | 5,820 | 20.2 | 6,745 | 18.8 |
| Per capita income | 2,376 | | 2,912 | |

w-withheld

Source: BBER 1977

The first and third largest employment sectors in the county are services and trade, respectively. The high percentage of persons so employed indicate that many of these positions are dependent on tourism for support; however, tourism is seasonal, causing a somewhat unstable job market in sectors that account for 59 percent of all nonfarm positions. Government, the second largest employment category, accounts for over 24 percent of all nonfarm jobs in the county. The combination of services, trade, and government provides over 83 percent of all nonfarm county jobs. 1974 data from Table 2.3-1 is not explicit in terms of farm or mining employment. However, by subtracting nonagricultural employment from total employment, then subtracting out mining employment (notes, Table 2.3-1), a conservative but reasonable estimate of agricultural employment can be derived. Thus, agriculture provides employment for an estimated 1,000 persons, or about 17 percent of total county employment.

Employment according to ethnic background provides an interesting look at the difference between participation in the work force by racial groups. As previously mentioned in Section 2.2, 86.3 percent of the county's residents are of Spanish descent; according to Table 2.3-2, Spanish surnamed persons are significantly less represented in the labor force than their overall population component would normally indicate. The implication is that Spanish surnamed persons are underemployed in Taos County and are perhaps earning a livelihood outside of normal employment channels.

Income as compared for 1972 and 1974 (Table 2.3-3) shows the decline of agriculture as an important economic element in the county, and an increase in the importance of government (especially state and local), contract construction and trade. Comparisons between percentages of employment and income by sector for 1974 reveal important relationships within the county: while agriculture provided an estimated 17 percent of all jobs, it only provided 1.2 percent of total income; the other major income disparity occurred in the service sector, where 39.7 percent of all jobs accounted for an estimated 18.8 percent of all income (1974 income data for the service sector is unavailable--18.8 percent is the figure attributed to service sector income in 1970).

The fact that Taos County residents exist in a relatively depressed economy is illustrated by per capita income figures. Table 2.3-3 indicates 1974 per capita income as $2,912, as compared to the state average of $4,139 and a national average of $5,448 (BBER 1977). County residents earned only 62 percent of the per capita income of Albuquerque residents and registered the fifth lowest county figure in the state in 1974; all of the counties with lower income figures were surrounding counties in northern New Mexico. Taos also had the fifth lowest family income figure for 1974 ($5,308) of all New Mexico counties, which was only 68 percent of the statewide average of $7,849; again, only the surrounding counties had lower figures. Almost 36 percent of Taos' families earned less than poverty level income in 1974 compared to the state average of 18.5 percent; only 7.1 percent of all families were in the $15,000 per year and over category, as compared to the state average of 14.8 percent (BBER 1977). Total financial and medical assistance payments made in the county in fiscal year 1975-76 represented 6.2 percent of the county's 1974 total labor and proprietors income; this compared to 2.2 percent for the state average. Additionally, 31.3 percent of all Taos residents in 1974 were certified for the USDA Food Stamp Program as compared to 19.8 percent of all state residents; 26.3 percent of county residents participated in the program compared to 13.7 percent statewide (BBER 1977).

Major developments are expected to occur in the county that will introduce more stability and additional growth to the economy: Molycorp, Inc., operates a large molybdenum mine east of Questa in the Red River valley. Molycorp in 1978 employed 395 persons--265 in the surface mine operation and 130 in the milling operation (NMEMD 1978). Molycorp has recently announced plans to expand their mining activity into an underground mining operation and to add additional milling capacity; this expansion alone should create about 600 additional direct jobs in the Questa area (McGraw 1979).

The Rio Costilla Cooperative Livestock Association is studying the feasibility of constructing a winter ski area on private lands east of the exchange lands in the Rio Costilla valley; the initial investment would total $20 million with up to $60 million in the second phase. Although the project is only in the initial planning stages, discussion centers on opening for business in the 1982-83 season (Gonzales 1979). The new ski area will be designed to accomodate 4,500 skiers per day, making it one of the largest ski areas in the state, and the fourth ski area in Taos County.

## 2.4 Planning Recommendations and Other Considerations

### 2.4.1 Federal, State, or Local Programs

No known federal, state, or local programs will affect or be affected by the proposed exchange.

### 2.4.2 State and Local Planning and Zoning Ordinances

Taos County is currently preparing a comprehensive master plan. It is not expected to affect or be affected by the proposed exchange.

### 2.4.3 BLM Planning

The BLM Rio Grande Management Framework Plan (MFP) recommends the "...acquisition of Ute Mountain for its unique natural values and the buffer area it provides to the Rio Grande Wild and Scenic River."

### 2.4.4 Citizens' Attitudes

While some persons or groups may oppose BLM acquisition of the exchange lands, interviews with various individuals would suggest a generally positive attitude. This is primarily based on the idea of increased public access. People interviewed included:

Richard Gonzales, Manager, Rio Costilla Cooperative Livestock Association

Ernest Jaquez, Urraca Wildlife Area, New Mexico Department of Game and Fish

Allen Vigil, Assistant County Manager/Planner, Taos County

## 3.0 SITE ANALYSIS

The following study area map (Figure 3.1) portrays the boundary of the 19,888.227± acres proposed for exchange. Unless otherwise noted, study area refers to only the exchange lands.

## 3.1 Land Status

Only the land status of the study area will be discussed. Adjoining land uses and land ownership will be discussed in Sections 3.6 and 3.7. Land use and ownership maps (Figure 3.9 and3.10) may be found in these sections.

### 3.1.1 Land Ownership

Ownership of the surface estate of the study area was acquired by Public Service Land Company (PSLC) on March 22, 1977 (Attachment 1). A title insurance policy was included with the transfer of deed (Lawyers Title Insurance Corp. 1977). On December 30, 1977, the proposed exchange lands were conveyed to Public Service Company of New Mexico and Franklin Land and Resources, Inc. in undivided 50 percent interests. The property known as Top o' the World Farms, adjacent to the exchange lands, was surveyed and retained in separate ownership by Public Service Land Company, now Paragon Resources.

Public Service Company of New Mexico
a New Mexico corporation
Post Office Box 2267
Albuquerque, NM 87110

Franklin Land and Resources, Inc.
a New Mexico corporation
Post Office Box 6
215 North Stanton Street
El Paso, TX 79940

### 3.1.2 Rights Granted

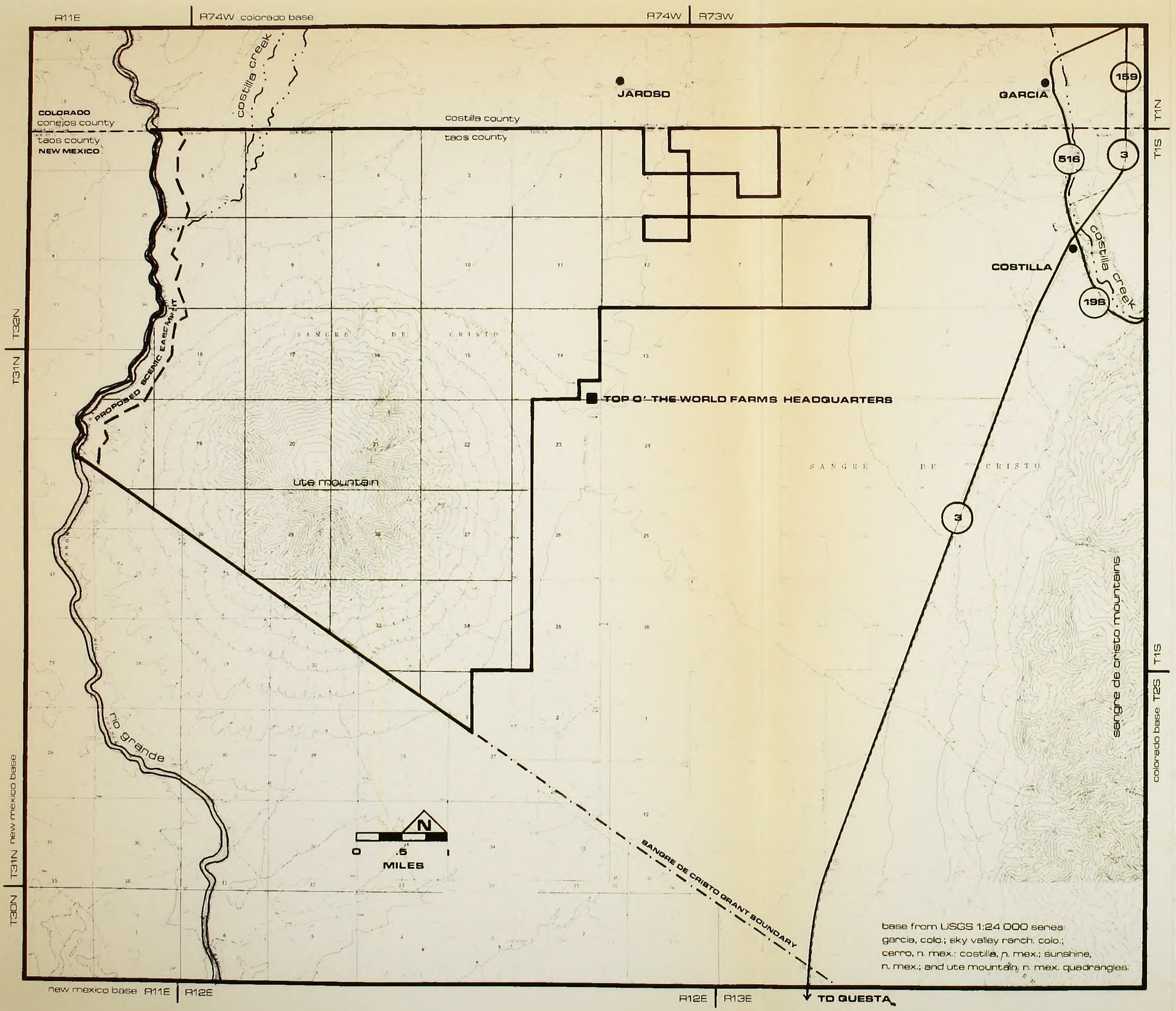
The acquisition carried with it two reservations and rights-of-way for roads, ditches, and utilities. No specific documents of rights-of-way for roads, ditches, or utilities pertaining to the exchange lands were attached to the deed or otherwise located.

One reservation is in the Rio Costilla Cooperative Livestock Association for a nonparticipating 1/4 undivided interest in and to the oil, gas, and minerals lying upon or beneath the surface of the study area tracts.

The second, in A. K. McMillan, is a reservation of 3/8 mineral interest in and under and that may be produced from the above described property together with the right of ingress and egress for the purpose of mining, drilling, and exploring for oil, gas, and other minerals, and removing the same therefrom.

Currently, no grazing rights are associated with the property. New Mexico Department of Game and Fish antelope hunting rights (four permits) transfer with the exchange lands (Attachment 2).

While no water rights will be conveyed with the exchange lands, the New Mexico State Engineer shall issue water permits upon filing a request for domestic or livestock uses according to Article 12 of Statutes 72-12-1 of the 1978



base from USGS 1:24 000 series: garcia, colo.; sky valley ranch, colo.; cerro, n. mex.; costilla, n. mex.; sunshine, n. mex.; and ute mountain, n. mex. quadrangles.

# ENVIRONMENTAL RESOURCE EVALUATION

OF THE PROPOSED

# TOP O' THE WORLD EXCHANGE LANDS

## STUDY AREA

| | |
|---|---|
| — | PROPOSED TOP O' THE WORLD EXCHANGE LANDS BOUNDARY |
| - - - | PROPOSED SCENIC EASEMENT BOUNDARY |

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.1

Statutes Annotated. An individual permit allows the use of up to three acre-feet of water per year, and several permits may be associated with a single tract of land as needed (Reed 1979).

### 3.1.3 Restrictions

Powersite withdrawal lands occur along the Rio Grande. The withdrawal boundaries correspond with the Rio Grande Wild River boundaries; the more restrictive designation (the Wild River) will apply.

### 3.1.4 Previous Classification

The exchange lands lie within the boundaries of the defunct Sangre de Cristo land grant. The land grant will be discussed in Section 3.7.1.

A subdivision boom in Taos County began and ended in the early 60s with five developments (Mimbres and Associates 1978). One of these developments was within the exchange land boundaries while one was adjacent (Figure 3.10). Neither of the projects were significantly developed and lots within the exchange lands had been repurchased at the time of sale to PSLC (Quitclaim Deed recorded May 6, 1977 in book A-143, page 238, Taos County Clerk's office) (Attachment 3).

The Rio Grande Estates, adjacent to the exchange lands, were developed in 1962. The one approved unit (one square mile) contained 2,244 lots (Mimbres and Associates 1978).

Sunshine Valley Estates were platted in 1963 and contained 7,342 lots (Mimbres and Associates 1978). The subdivision filed a declaration of vacation on February 16, 1977.

### 3.1.5 Pending Applications

A BLM easement is currently pending for 692.82 acres for a scenic easement associated with the wild river area. The easement would "protect the scenic, recreational, geologic, fish and wildlife, historic, cultural, and other similar values of the free flowing Rio Grande and its immediate environment and prevent any developments or changes which would tend to detract from the essentially primitive character of this wild river area."

### 3.1.6 Mining Locations

No known mining locations exist on the exchange lands. For details on mining in the surrounding areas see Section 3.7.2.

### 3.1.7 Other Factors

No other factors related to land status affect the exchange lands.

## 3.2 Location and Identification

Location of the proposed exchange lands are shown on the study area map (Figure 3.1). The map was prepared using U.S. Geological Survey Maps for the base. All boundary lines were drawn from survey plats of the properties provided by Rio Grande Surveying Service of Taos, New Mexico, from a survey of the property conducted in December 1977 (Figure 3.2). Standard surveying techniques were employed in the survey, as noted on the plat, which used the Colorado survey base. The property is generally described as:

> A certain tract of land near Costilla, Taos County, New Mexico, described as part of the westerly portion of the Sangre de Cristo Land Grant and Sections 7, 8, and part of Section 6, Township 1 South, Range 73 West, part of Sections 1 and 12, all of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 34, and part of Sections 14, 23, 26, 29, 35, 30, 32, and 33, Township 1 South, Range 74 West, part of Sections 3 and 4, Township 2 South, Range 74 West, of a private survey for the Costilla Estate Development Company by T. C. McPherson, as shown on a Map of Sectionizing filed in the Taos County Courthouse on May 11, 1920. The property is further described by metes and bounds as noted on Figure 3.2.

## 3.3 Physical and Legal Access

The exchange lands may be accessed from three directions: roads are portrayed on the Land Use map, Figure 3.10. In Colorado, access is provided by county roads west from Garcia and south from Jaroso. In New Mexico, an inventory of Taos county-maintained roads compiled in 1964 delineates the county road system. Additionally, a 1964 County Commission resolution declared that all roads maintained by the county were county roads. An update of the 1964 inventory is being contemplated by Taos County but no action has been taken to date (Vigil 1979). The legal status of county-maintained roads is addressed in a letter from Allen Vigil, Taos Assistant County Manager/Planner (Attachment 4).

From the south, the exchange lands abut 3 1/2 miles of BLM land. If the BLM has legal access to these lands, roads that cross the BLM land into the exchange lands provide a third route of access.

## 3.4 Physical Description and Environmental Considerations

The following describes the physical and environmental features of the proposed exchange lands and includes the immediate surroundings wherever descriptions of a broader area are important considerations.

### 3.4.1 Geology

The following is a synopsis of information from Winograd 1959, Technical Report No. 12.

The Sunshine Valley is a reentrant between two prongs of the southern Rocky Mountains. Mountain building began in late Cretaceous and early Tertiary time by compression of the earth's crust causing rock deformation. Renewed uplifting occurred through Miocene time and continues today; uplifting was uneven, however, creating the Rio Grande trough between the mountain prongs. The trough received eroded materials from the bordering highlands and lavas from the numerous volcanoes and fissures throughout the area, including Ute Mountain. The valley fill materials are collectively known as the Santa Fe group, which is the major regional aquifer.

#### 3.4.1.1 Stratigraphy

Rock outcrops in Sunshine Valley are of igneous, metamorphic, and sedimentary origin, ranging in age from Precambrian to Recent. The oldest are Precambrian, cropping out largely within the Sangre de Cristo Mountains and in isolated hills protruding through the lava-capped plateau. Paleozoic rocks of

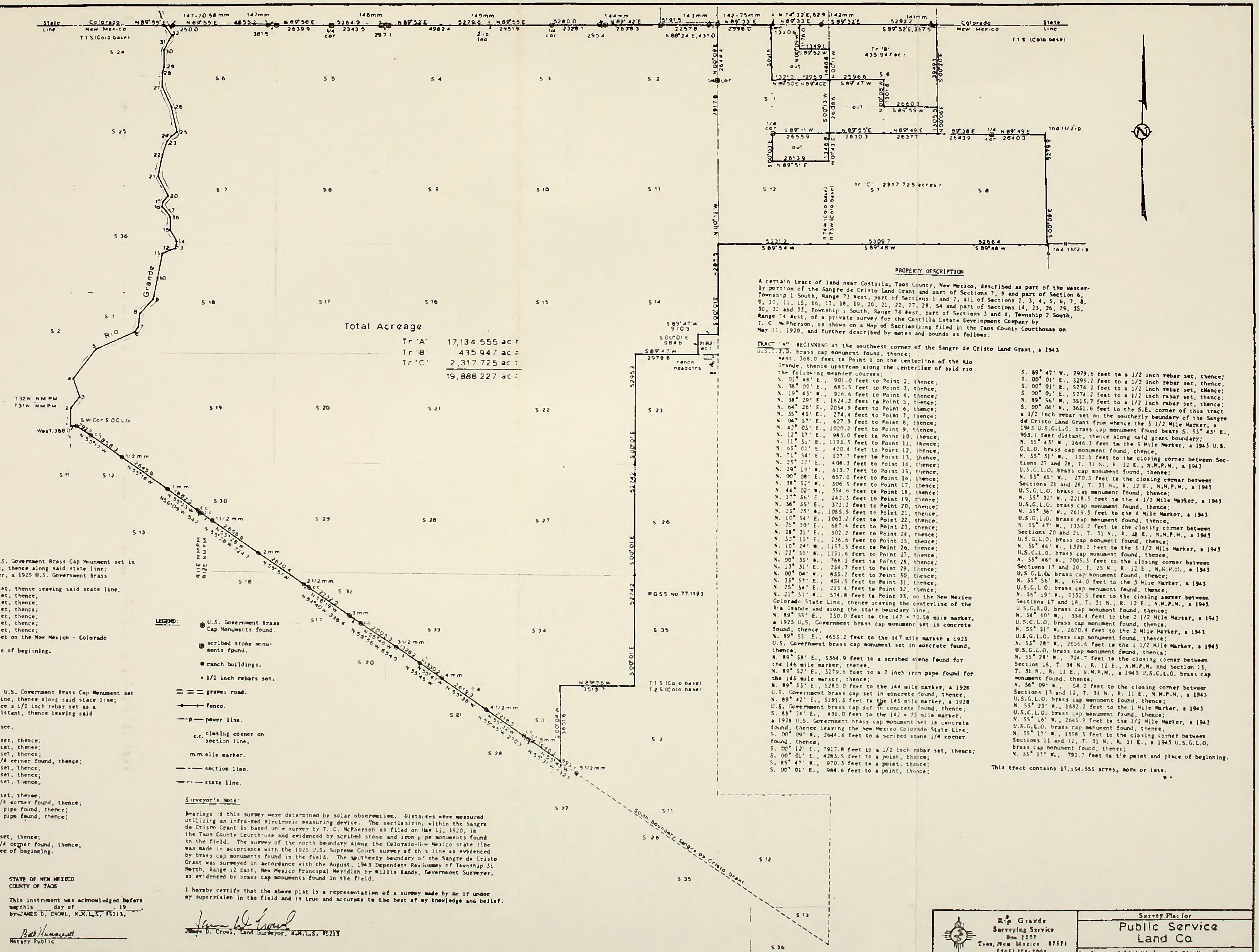


FIGURE 3.2

### Meander Traverse
### Centerline Rio Grande

| Station # | Bearing | Distance |
|---|---|---|
| 1. | N. 01° 48' E. | 901.0 feet |
| 2. | N. 38° 00' E. | 680.5 feet |
| 3. | N. 19° 43' W. | 926.6 feet |
| 4. | N. 38° 29' E. | 1824.2 feet |
| 5. | N. 64° 26' E. | 2034.9 feet |
| 6. | N. 35° 45' E. | 274.4 feet |
| 7. | N. 04° 57' E. | 627.9 feet |
| 8. | N. 42° 05' E. | 1020.2 feet |
| 9. | N. 12° 17' E. | 983.0 feet |
| 10. | N. 11° 51' E. | 1195.3 feet |
| 11. | N. 65° 01' E. | 420.4 feet |
| 12. | N. 71° 54' E. | 127.7 feet |
| 13. | N. 23° 22' E. | 408.3 feet |
| 14. | N. 29° 19' W. | 613.7 feet |
| 15. | N. 00° 08' E. | 657.0 feet |
| 16. | N. 38° 52' W. | 306.3 feet |
| 17. | N. 44° 02' W. | 354.6 feet |
| 18. | N. 17° 56' E. | 242.3 feet |
| 19. | N. 36° 55' E. | 372.2 feet |
| 20. | N. 25° 23' W. | 1085.5 feet |
| 21. | N. 10° 54' E. | 1063.2 feet |
| 22. | N. 25° 30' E. | 687.4 feet |
| 23. | N. 28° 31' E. | 302.2 feet |
| 24. | N. 52° 15' E. | 236.6 feet |
| 25. | N. 10° 24' W. | 1157.3 feet |
| 26. | N. 22° 55' W. | 1151.6 feet |
| 27. | N. 00° 35' W. | 768.2 feet |
| 28. | N. 13° 31' E. | 254.7 feet |
| 29. | N. 00° 04' W. | 855.2 feet |
| 30. | N. 35° 57' E. | 454.5 feet |
| 31. | N. 25° 54' E. | 215.4 feet |
| 32. | N. 21° 51' W. | 574.8 feet |
| 33. | | |

TRACT "B" BEGINNING at the 142 mile marker, a 1925 U.S. Government Brass Cap Monument set in concrete found on the New Mexico - Colorado state line, thence along said state line;
S. 89° 52' E., 5292.2 feet to the 141 mile marker, a 1925 U.S. Government Brass Cap Monument set in concrete, thence;
S. 89° 52' E., 267.5 feet to a 1/2 inch rebar set, thence leaving said state line;
S. 00° 20' E., 3949.1 feet to a 1/2 inch rebar set, thence;
S. 89° 59' W., 2660.3 feet to a 1/2 inch rebar set, thence;
N. 00° 08' W., 1301.8 feet to a 1/2 inch rebar set, thence;
S. 89° 47' W., 2596.6 feet to a 1/2 inch rebar set, thence;
N. 00° 11' W., 1488.8 feet to a 1/2 inch rebar set, thence;
S. 89° 52' W., 1349.1 feet to a 1/2 inch rebar set, thence;
N. 00° 09' W., 1176.0 feet to a 1/2 inch rebar set on the New Mexico - Colorado state line, thence along said state line;
N. 89° 33' E., 1034.2 feet to the point and place of beginning.

This tract contains 435.947 acres, more or less.

TRACT "C" BEGINNING at the 142+75 mile marker, a 1925 U.S. Government Brass Cap Monument set in concrete found on the New Mexico - Colorado state line, thence along said state line;
N. 89° 33' E., 2596.0 feet to a point from whence a 1/2 inch rebar set as a witness corner bears N. 74° 32' E., 62.9 feet distant, thence leaving said state line;
South, 2660.5 feet to a 1/2 inch rebar set, thence;
N. 89° 50' E., 1321.3 feet to a point, thence;
N. 89° 40' E., 1295.9 feet to a 1/2 inch rebar set, thence;
S. 85° 00' E., 60.5 feet to a 1/2 inch rebar set, thence;
S. 00° 13' W., 2608.6 feet to a 1/2 inch rebar set, thence;
S. 89° 11' W., 2655.9 feet to a scribed stone 1/4 corner found, thence;
S. 00° 03' E., 1315.0 feet to a 1/2 inch rebar set, thence;
N. 89° 51' E., 2613.9 feet to a 1/2 inch rebar set, thence;
N. 01° 43' E., 1346.8 feet to a 1/2 inch rebar set, thence;
N. 89° 55' E., 2630.3 feet to a point, thence;
N. 89° 49' E., 2637.1 feet to a 1/2 inch rebar set, thence;
S. 89° 38' E., 2643.9 feet to a scribed stone 1/4 corner found, thence;
N. 89° 49' E., 2640.3 feet to a 1 1/2 inch iron pipe found, thence;
S. 00° 09' E., 5279.9 feet to a 1 1/2 inch iron pipe found, thence;
S. 89° 48' W., 5266.4 feet to a point, thence;
S. 89° 48' W., 5309.7 feet to a point, thence;
S. 89° 54' W., 5231.2 feet to a 1/2 inch rebar set, thence;
N. 00° 12' W., 7917.8 feet to a scribed stone 1/4 corner found, thence;
N. 00° 09' E., 2644.4 feet to the point and place of beginning.

This tract contains 2317.725 acres, more or less.

STATE OF NEW MEXICO
COUNTY OF TAOS

This instrument was acknowledged before me this ____ day of __________, 19___, by JAMES D. CROWL, N.M.L.S. #5213.

Beth Hunnicutt
Notary Public

My commission expires 12/16/80.

Total Acreage

| | |
|---|---|
| Tr 'A' | 17,134 555 ac ± |
| Tr 'B' | 435 947 ac ± |
| Tr 'C' | 2,317 725 ac ± |
| | 19,888 227 ac ± |

LEGEND:

| | |
|---|---|
| ◉ | U.S. Government Brass Cap Monuments found. |
| ▣ | scribed stone monuments found. |
| ● | ranch buildings. |
| • | 1/2 inch rebars set. |
| ═ ═ ═ | gravel road. |
| —×— | fence. |
| —p— | power line. |
| c.c. | closing corner on section line. |
| m.m. | mile marker. |
| — - — | section line. |
| — · · — | state line. |

Surveyor's Note:

Bearings of this survey were determined by solar observation. Distances were measured utilizing an infra-red electronic measuring device. The sectionizing within the Sangre de Cristo Grant is based on a survey by T. C. McPherson as filed on May 11, 1920, in the Taos County Courthouse and evidenced by scribed stone and iron pipe monuments found in the field. The survey of the north boundary along the Colorado-New Mexico state line was made in accordance with the 1925 U.S. Supreme Court survey of this line as evidenced by brass cap monuments found in the field. The southerly boundary of the Sangre de Cristo Grant was surveyed in accordance with the August, 1943 Dependent Re-Survey of Township 31 North, Range 12 East, New Mexico Principal Meridian by Willis Sandy, Government Surveyor, as evidenced by brass cap monuments found in the field.

I hereby certify that the above plat is a representation of a survey made by me or under my supervision in the field and is true and accurate to the best of my knowledge and belief.

James D. Crowl
James D. Crowl, Land Surveyor, N.M.L.S. #5213

PROPERTY DESCRIPTION

A certain tract of land near Costilla, Taos County, New Mexico, described as part of the westerly portion of the Sangre de Cristo Land Grant and part of Sections 7, 8 and part of Section 6, Township 1 South, Range 73 West, part of Sections 1 and 2, all of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 15, 16, 17, 18, 19, 20, 21, 22, 27, 28, 34 and part of Sections 14, 23, 26, 29, 35, 30, 32 and 33, Township 1 South, Range 74 West, part of Sections 3 and 4, Township 2 South, Range 74 West, of a private survey for the Costilla Estate Development Company by T. C. McPherson, as shown on a Map of Sectionizing filed in the Taos County Courthouse on May 11, 1920, and further described by metes and bounds as follows:

TRACT "A" BEGINNING at the southwest corner of the Sangre de Cristo Land Grant, a 1943 U.S.G.L.O. brass cap monument found, thence;
West, 368.0 feet to Point 1 on the centerline of the Rio Grande, thence upstream along the centerline of said rio the following meander courses;
N. 01° 48' E., 901.0 feet to Point 2, thence;
N. 38° 00' E., 680.5 feet to Point 3, thence;
N. 19° 43' W., 926.6 feet to Point 4, thence;
N. 38° 29' E., 1824.2 feet to Point 5, thence;
N. 64° 26' E., 2054.9 feet to Point 6, thence;
N. 35° 45' E., 274.4 feet to Point 7, thence;
N. 04° 57' E., 627.9 feet to Point 8, thence;
N. 42° 05' E., 1020.2 feet to Point 9, thence;
N. 12° 17' E., 983.0 feet to Point 10, thence;
N. 11° 51' E., 1195.3 feet to Point 11, thence;
N. 65° 01' E., 420.4 feet to Point 12, thence;
N. 71° 54' E., 127.7 feet to Point 13, thence;
N. 23° 22' E., 408.3 feet to Point 14, thence;
N. 29° 19' W., 613.7 feet to Point 15, thence;
N. 00° 08' E., 657.0 feet to Point 16, thence;
N. 38° 52' W., 306.3 feet to Point 17, thence;
N. 44° 02' W., 354.6 feet to Point 18, thence;
N. 17° 56' E., 242.3 feet to Point 19, thence;
N. 36° 55' E., 372.2 feet to Point 20, thence;
N. 25° 23' W., 1085.5 feet to Point 21, thence;
N. 10° 54' E., 1063.2 feet to Point 22, thence;
N. 25° 30' E., 687.4 feet to Point 23, thence;
N. 28° 31' E., 302.2 feet to Point 24, thence;
N. 52° 15' E., 236.6 feet to Point 25, thence;
N. 10° 24' W., 1157.3 feet to Point 26, thence;
N. 22° 55' W., 1151.6 feet to Point 27, thence;
N. 00° 35' W., 768.2 feet to Point 28, thence;
N. 13° 31' E., 254.7 feet to Point 29, thence;
N. 00° 04' W., 855.2 feet to Point 30, thence;
N. 35° 57' E., 454.5 feet to Point 31, thence;
N. 25° 54' E., 215.4 feet to Point 32, thence;
N. 21° 51' W., 574.8 feet to Point 33, on the New Mexico Colorado State Line, thence leaving the centerline of the Rio Grande and along the state boundary line;
N. 89° 55' E., 250.0 feet to the 147 + 70.58 mile marker, a 1925 U.S. Government brass cap monument set in concrete found, thence;
N. 89° 55' E., 4655.2 feet to the 147 mile marker a 1925 U.S. Government brass cap monument set in concrete found, thence;
N. 89° 58' E., 5364.9 feet to a scribed stone found for the 146 mile marker, thence;
N. 89° 52' E., 5279.6 feet to a 2 inch iron pipe found for the 145 mile marker, thence;
N. 89° 55' E., 5280.0 feet to the 144 mile marker, a 1928 U.S. Government brass cap set in concrete found, thence;
N. 89° 42' E., 5191.5 feet to the 143 mile marker, a 1928 U.S. Government brass cap set in concrete found, thence;
S. 88° 24' E., 431.0 feet to the 142 + 75 mile marker, a 1928 U.S. Government brass cap monument set in concrete found, thence leaving the New Mexico Colorado State Line;
S. 00° 09' W., 2644.4 feet to a scribed stone 1/4 corner found, thence;
S. 00° 12' E., 7917.8 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 4285.5 feet to a point, thence;
S. 89° 47' W., 970.3 feet to a point, thence;
S. 00° 01' E., 984.6 feet to a point, thence;
S. 89° 47' W., 2979.6 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 5295.2 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 5274.2 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 5274.2 feet to a 1/2 inch rebar set, thence;
N. 89° 56' W., 3513.7 feet to a 1/2 inch rebar set, thence;
S. 00° 04' W., 3651.6 feet to the S.E. corner of this tract a 1/2 inch rebar set on the southerly boundary of the Sangre de Cristo Land Grant from whence the 5 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found bears S. 55° 43' E., 993.1 feet distant, thence along said grant boundary;
N. 55° 43' W., 1646.3 feet to the 5 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 31' W., 132.1 feet to the closing corner between Sections 27 and 28, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 45' W., 270.3 feet to the closing corner between Sections 21 and 28, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 32' W., 2218.5 feet to the 4 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 36' W., 2619.3 feet to the 4 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 47' W., 1330.2 feet to the closing corner between Sections 20 and 21, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 46' W., 1328.2 feet to the 3 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 46' W., 2005.3 feet to the closing corner between Sections 17 and 20, T. 25 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 56' W., 654.0 feet to the 3 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 56° 19' W., 2332.5 feet to the closing corner between Sections 17 and 18, T. 31 N., R. 12 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 54° 40' W., 338.4 feet to the 2 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 51' W., 2670.4 feet to the 2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 28' W., 2656.6 feet to the 1 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 28' W., 724.7 feet to the closing corner between Section 18, T. 31 N., R. 12 E., N.M.P.M. and Section 13, T. 31 N., R. 11 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 56° 09' W., 54.2 feet to the closing corner between Sections 13 and 12, T. 31 N., R. 11 E., N.M.P.M., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 23' W., 1882.2 feet to the 1 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 16' W., 2645.9 feet to the 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 17' W., 1858.3 feet to the closing corner between Sections 11 and 12, T. 31 N., R. 11 E., a 1943 U.S.G.L.O. brass cap monument found, thence;
N. 55° 17' W., 792.7 feet to the point and place of beginning.

This tract contains 17,134.555 acres, more or less.

Rio Grande
Surveying Service
Box 2257
Taos, New Mexico 87571
(505) 758-2901

Survey Plat for
Public Service
Land Co

location: near Costilla, Taos County, New Mexico
scale: 1" = 2000' | date: Dec 22 1977 | survey no. [illegible]

the Sangre de Cristo formation crop out in small areas of the mountains of the same name; these rocks are considered to be of Pennsylvanian and Permian age. Igneous rocks of varying composition which comprise much of the Sangre de Cristo Mountains and several of the isolated mountain and hill features of the lava-capped plateau are of Tertiary age. Tertiary and Quaternary age valley fill and lava make up the Santa Fe group which crops out in most of the region and uncomformably overlies the Precambrian and mid-Tertiary rocks except where they protrude above the general land surface. Alluvium of Recent age occurs along stream courses.

### 3.4.1.2 Geologic History

Historically, the Cenozoic era saw many of the geologic events occur that brought about and continue to shape the region. The Laramide Revolution, which brought about formation of the Rocky Mountain system, is considered to have begun in late Cretaceous-early Tertiary time; the revolution was characterized by compression of rocks into great folds and thrust faults, with much attendent volcanism. Late (?) Tertiary (Miocene?) time saw the uplift along fault zones of the Sangre de Cristo and Conejos prongs and localized the present outcrops of the middle (?) Tertiary volcanic rocks. A Miocene landscape topographically similar to the present landscape was thus created, and deposition of valley fill into the downfaulted areas ensued.

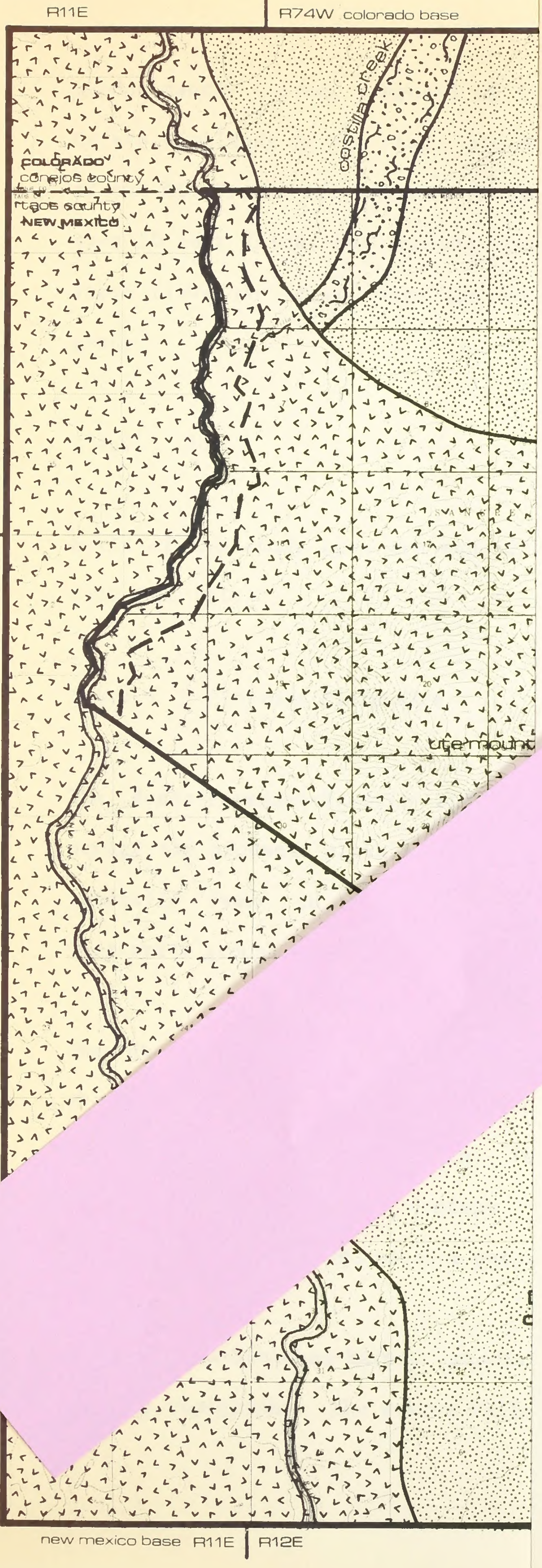
Continued uplift of the highlands maintained the Miocene trough which, through subsidence, preserved the thick alluvial sediments and lava flows of the Santa Fe group. Deposits of alluvial sediments dominated during Miocene and Pliocene time. However, in late (?) Pliocene and early Pleistocene time, andesite-basalt extrusions occurred on a large scale. Guadalupe and Ute Mountains, Cerro de la Olla, and San Antonio Peak erupted, intermittently spewing lava in all directions and constructing a vast lava plateau. Due to the intermittent nature of the eruptions, alluvium and lava flows are interbedded near the highlands. Highland uplifting, depression of portions of the valley and deposition of detritus into the lowlands continues at present.

#### 3.4.1.3 Subsurface Geology

Interbedding of lavas and alluvial sediments occurs extensively east of the Rio Grande along the mountain front; sediments from the highlands to the east were partially buried by lava flows from the west and vice-versa. This occurs at depth, according to well logs, east and southeast of Ute Mountain, where sediments are interbedded with thin flows from the volcano. In Sunshine Valley, the lava crops out in a narrow 0.5-1.0 mile strip bordering the canyon of the Rio Grande on the east; elsewhere in the valley the lavas are buried. Lava flows strike nearly north-south and dip eastward. The plain burying the lava slopes westward; hence, depth to the lava increases from the Rio Grande toward the Sangre de Cristos.

#### 3.4.1.4 Surface Geology

Geologically, the proposed exchange lands are mapped on Figure 3.3. Stream channels, principally the upper reaches of Costilla Creek and various drainage channels, are composed of Recent age Quaternary alluvium. The eastern portion of the property is covered by alluvial sediments of the Santa Fe group of middle (?) Miocene to Pleistocene (?) age. These sediments are detritus,



# ENVIRONMENTAL RESOURCE EVALUATION

OF THE PROPOSED

# TOP O' THE WORLD EXCHANGE LANDS

## GEOLOGY

▨ QUATERNA
ALLUVIU

▨ TER
N

R

C COMPLEX
SSOCIATED ROCKS

RECAMBRIAN GRANITE, GNEISS, SCHIST AND QUARTZITE

— - FAULT, DASHED WHERE LOCATION APPROXIMATE

SOURCE:
WINOGRAD 1959

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.3

predominantly coarse, composed of clay, sand, and gravels from the Sangre de Cristo highlands to the east. Ute Mountain itself and the area up to and west of the Rio Grande are composed of andesite-basalt lava in flows generally less than 50 feet thick, and include volcanic ash, cinders, and thin clay strata. These flows are of the same age and grouping as the alluvium of the Santa Fe group.

### 3.4.2 Soils

Soils of the study area are mapped on Figure 3.4; soils information is taken from NMSU 1974.

#### 3.4.2.1 Piedmont Plain Area

The Hondo-Fernando-Tenorio and Dormilon-Stoneham-Harvey soil associations occupy the piedmont plain areas of the exchange lands. These associations are generally found in conjunction with the sagebrush-grassland (disturbed) vegetative group.

The Hondo-Fernando-Tenorio association occurs on nearly level to moderate slopes. The soils, which are dominantly moderately deep and deep, are forming in old alluvium of mixed origin. The resulting soils are clayey or loamy and gravelly with a high lime content. Due to the high permeability of the soils within this association, erosion potential is low.

The Dormilon-Stoneham-Harvey association occurs on nearly level to moderately sloping topography. The canyon walls, escarpments, and breaks adjacent to the

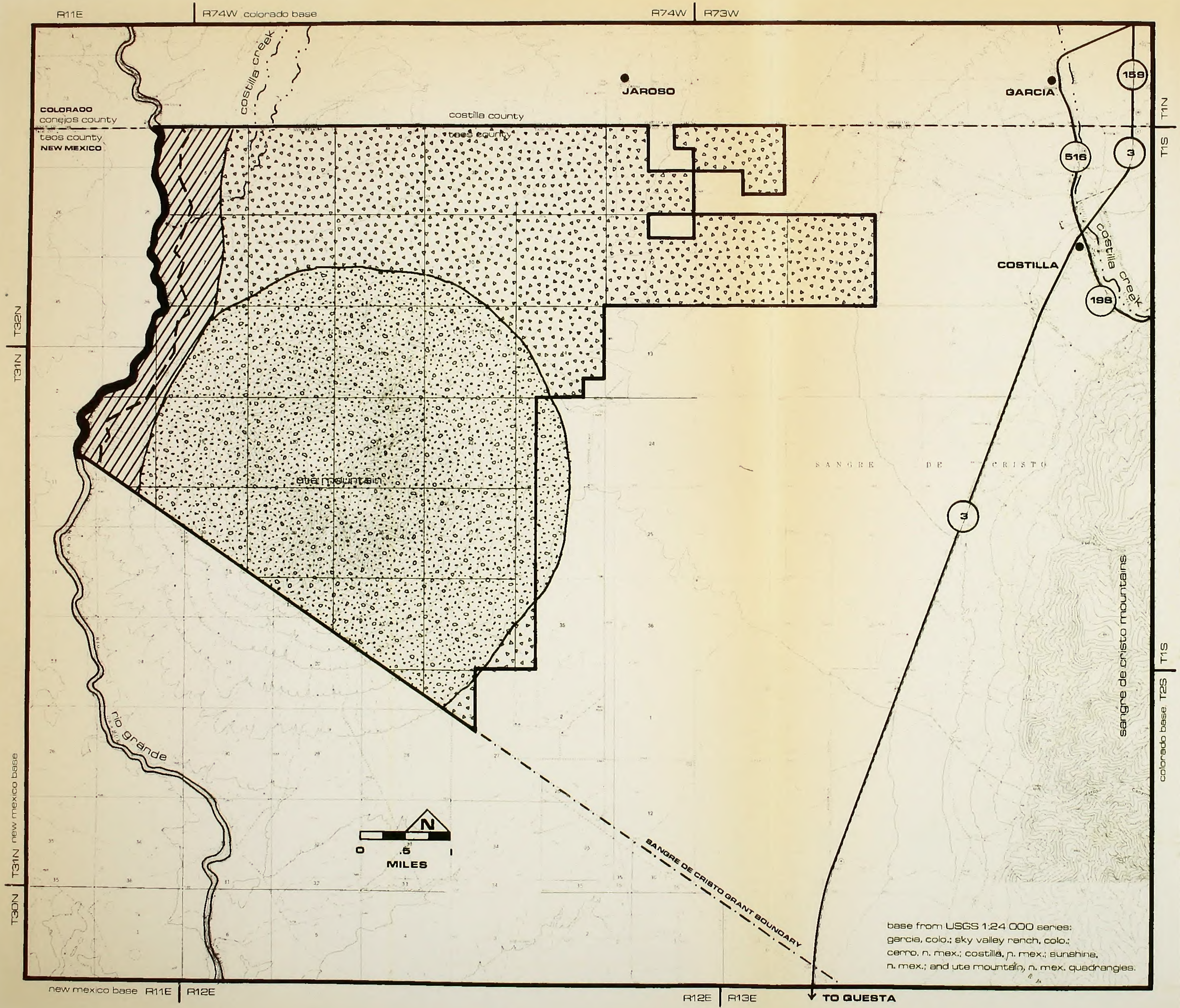
Rio Grande included in this association, however, are steep to very steep. These soils are forming dominantly in materials of volcanic or basic igneous origin on old lava flows. A characteristic feature is the stony and cobbly nature of many of the soils; although the depth or thickness of these soils varies, they are mainly shallow to moderately deep over basalt bedrock, stones, or soil layers containing lime. The soils in this association are low to moderately erodible.

### 3.4.2.2 Rio Grande Gorge

Rockland, a miscellaneous land type, is the descriptive term for the sparse soil and extensive rock areas in the Rio Grande gorge. It consists of steep to very steep canyon walls, escarpments, and breaks adjacent to the Rio Grande. It consists mainly of a complex of shallow stony soils and exposures or outcrops of basalt bedrock. Although the soils intermingled with the rock outcrops are dominantly shallow, they are quite variable in depth and other characteristics. Much of the soil surface between the outcrops of basalt is covered with stones and boulders.

### 3.4.2.3 Ute Mountain

Soils occurring on Ute Mountain are in the Barela-Pinata-Rockland association. This association occurs on moderately steep to steep slopes and are deep loamy or gravelly soils. Rock outcrops occur throughout this association. The soils are developing dominantly in materials of volcanic or basic igneous origin, principally basalt and basaltic andesite. Erosion hazard for this association is slight to moderate.



base from USGS 1:24 000 series: garcia, colo.; sky valley ranch, colo.; cerro, n. mex.; costilla, n. mex.; sunshine, n. mex.; and ute mountain, n. mex. quadrangles.

# ENVIRONMENTAL RESOURCE EVALUATION

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## SOIL ASSOCIATIONS

- ▨ HONDO-FERNANDO-TENORIO ASSOCIATION
- ■ ROCKLAND ASSOCIATION (gorge only)
- ▨ BARELA-PINATA-ROCKLAND ASSOCIATION
- ▨ DORMILON-STONEHAM HARVEY ASSOCIATION

SOURCE:
USDA, SCS 1974

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.4

### 3.4.3 Topography

The proposed exchange lands are composed of three district topographic features: a plain in the northern portion of the property, Ute Mountain, which dominates the landscape, and the gorge of the Rio Grande.

The plain, which is mainly piedmont (except for the area along the eastern rim of the Rio Grande gorge which is lava-capped), is generally featureless and relatively flat until the base of Ute Mountain. The plain slopes westward at 40 to 100 feet per mile. Maximum elevation is 7,711 feet at the extreme eastern property line, grading to about 7,500 feet at the edge of the Rio Grande gorge where Costilla Creek enters. Costilla Creek is the only landscape feature that interrupts the plain in the study area besides Ute Mountain. The creek enters the property from a northeasterly direction at the Colorado state line, running generally south to southwest for approximately 1.5 miles prior to joining the Rio Grande; the creek is ephemeral through this stretch. The creek enters the property at an elevation of about 7,450 feet and maintains a very gradual slope for about 0.75 miles before dropping rapidly through a narrow canyon cut through basalt to the Rio Grande. Elevation loss through the approximately 0.75 mile canyon is about 120 feet.

Ute Mountain, an extinct volcano, dominates the proposed exchange lands and is located on the southern portion of the property. The volcano is conically shaped, climbing from a base at approximately 7,600 feet to 10,093 feet; the diameter of the base of the mountain at 7,600 feet is approximately 5.25-5.5 miles in all directions. The mountain is generally wooded from about 8,300 feet to the top.

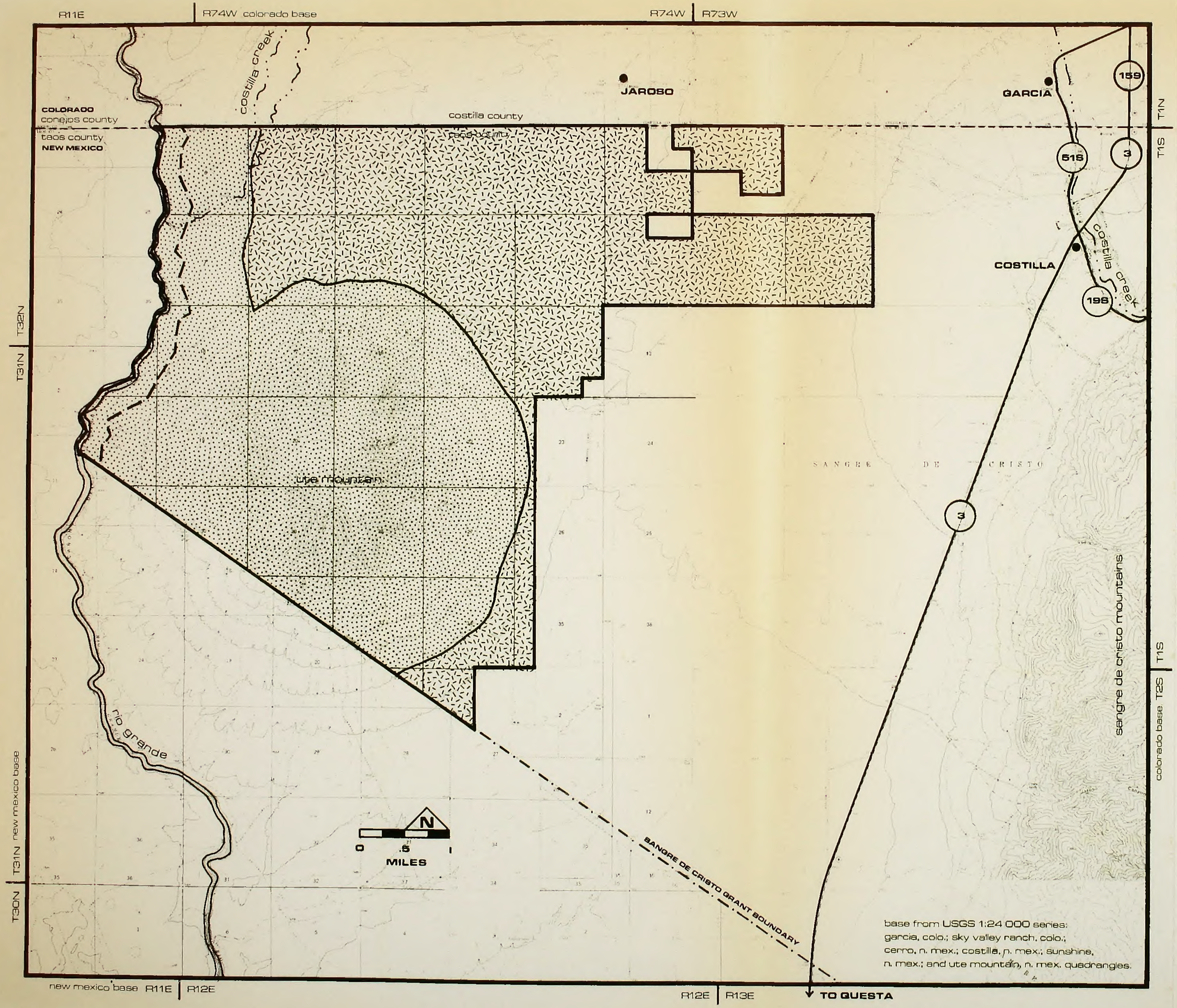
The Rio Grande flows north-south along the proposed exchange lands; the property boundary is the centerline of the river. The river has cut a nearly vertical canyon through the lava-capped plateau that stretches gently upslope to the west of the river and which extends just east of the river along the entire canyon edge. Elevations along the eastern canyon rim are about 7,500 feet throughout the exchange lands; river elevations change slightly however, decreasing over the four mile distance from about 7,400 feet at the state line to about 7,380 feet at the southern property line.

### 3.4.4 Water

The exchange lands are located in the Upper Rio Grande drainage basin. The principal surface water resource in this basin is the Rio Grande. Other than the Rio Grande, no perennial streams exist on the exchange lands. Groundwater suitable for irrigation is found in alluvial sediments that underlie most of the area. With the possible exception of seepages in the Rio Grande gorge, no springs are known to occur in the study area.

#### 3.4.4.1 Surface Water

The lower reaches of Costilla Creek drain the northwestern part of the exchange lands. Flows in the lower reaches of this creek are emphemeral due to channel seepage and upstream irrigation diversions. Numerous emphemeral washes that flow into the Rio Grande drain the remainder of the exchange land. Annual average runoff varies from 0.1 to 0.5 inches per year with the highest runoff occurring from Ute Mountain (USDA 1975). Sediment yield (erosion rate) varies from 0.2 to 1.0 acre-feet/square mile per year, with the lowest yield occurring in the Ute Mountain area (Figure 3.5).



base from USGS 1:24 000 series: garcia, colo.; sky valley ranch, colo.; cerro, n. mex.; costilla, n. mex.; sunshine, n. mex.; and ute mountain, n. mex. quadrangles.

# ENVIRONMENTAL RESOURCE EVALUATION

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## EROSION

ACRE FEET
PER SQUARE MILE
PER YEAR

| | |
|---|---|
| ▨ | 0.2-0.5 |
| ▨ | 0.5-1.0 |

SOURCE:
USDA, SCS 1977

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.5

Surface flows in the Rio Grande delivered by obligation to New Mexico from Colorado are measured about six miles above the state line near Lobatos, Colorado. Monthly average discharge of the Rio Grande at Lobatos for the period of record (1900-1978) varies from 240 to 1,772 cubic feet per second (cfs) (Table 3.4-1). Discharge is influenced largely by snowmelt runoff in the upper part of the drainage and by irrigation diversions upstream in the San Luis Valley in Colorado. Consequently, highest monthly flows occur in springtime and lowest monthly flows normally occur during the summer irrigation season. Because the Rio Grande gorge is deeply incised, there are no direct diversions from the river in New Mexico north of the Red River (Winograd 1959).

TABLE 3.4-1
MONTHLY AVERAGE DISCHARGE OF THE RIO GRANDE NEAR LOBATOS, COLORADO
(1900-1978)

| month | average discharge (cfs) |
|---|---|
| October | 321 |
| November | 358 |
| December | 309 |
| January | 277 |
| February | 325 |
| March | 435 |
| April | 571 |
| May | 1,510 |
| June | 1,772 |
| July | 547 |
| August | 240 |
| September | 240 |

Source: USDOI GS 1979

A comparison of annual discharges of the Rio Grande at Lobatos, Colorado, and at Cerro, New Mexico, (about seven miles upstream from the mouth of the Red River) indicates that the river can gain from 27,000 to 40,000 acre-feet of water annually between these locations (Table 3.4-2). Between these locations, practically no tributary surface flow enters the river (Winograd 1959). Therefore, this gain is attributed almost entirely to the accretion of groundwater.

### TABLE 3.4-2
### ANNUAL DISCHARGE OF THE RIO GRANDE AT LOBATOS, COLORADO, AND CERRO, NEW MEXICO
### (1948-1955)

| water year | discharge (acre-feet/yr) Lobatos[1] | Cerro[2] | gain (acre-feet/yr) |
|---|---|---|---|
| 1948-49 | 564,900 | 594,500 | 29,600 |
| 1949-50 | 152,200 | 191,300 | 39,100 |
| 1950-51 | 79,980 | 110,600 | 30,620 |
| 1951-52 | 447,900 | 477,300 | 29,400 |
| 1952-53 | 134,600 | 174,700 | 40,100 |
| 1953-54 | 71,570 | 98,360 | 26,790 |
| 1954-55 | 62,130 | 90,210 | 28,080 |

[1] Lobatos, Colorado, gaging station located six miles above state line.

[2] Cerro, New Mexico, gaging station located about seven miles above mouth of the Red River.

Source: Winograd 1959

Due to seepage into the alluvium and to diversions for irrigation, the lower section of Costilla Creek that flows through the exchange lands is often dry. Average annual discharge from the creek into the Rio Grande was about 80 acre-feet per year during the period 1948 to 1954 (Winograd 1959). Flows in the upper part of this creek (Table 3.4-3) near Costilla, New Mexico, are regulated by a reservoir and diversion dams. One of these diversions, the New Mexico Branch of the Cerro Canal, crosses the extreme eastern part of the exchange lands (Figure 3.10). Flows in this canal have varied from 0 to 29 cfs during the period 1944 to 1978 (USDOI, GS 1979-a). During the 1978 water year, 438 acre-feet of water were diverted into this canal (USDOI, GS 1979); however, none of this water was diverted for use on the exchange lands.

TABLE 3.4-3
MONTHLY AVERAGE DISCHARGE OF COSTILLA CREEK NEAR COSTILLA, NEW MEXICO
(1961-1978)

| month | average discharge (cfs) |
|---|---|
| October | 13 |
| November | 10 |
| December | 7 |
| January | 6 |
| February | 8 |
| March | 13 |
| April | 38 |
| May | 77 |
| June | 85 |
| July | 67 |
| August | 57 |
| September | 23 |

Source: USDOI, GS 1979

Water quality of the Rio Grande as observed at Lobatos, Colorado, for the period 1947 through 1978 is summarized in Table 3.4-4. Water in this section of the river is generally suitable for agricultural purposes (USDA, ERS 1974). Water quality deterioration caused by agricultural consumptive use, irrigation return flow, and sediment runoff increases in downstream sections of the river (NMWRRI 1973).

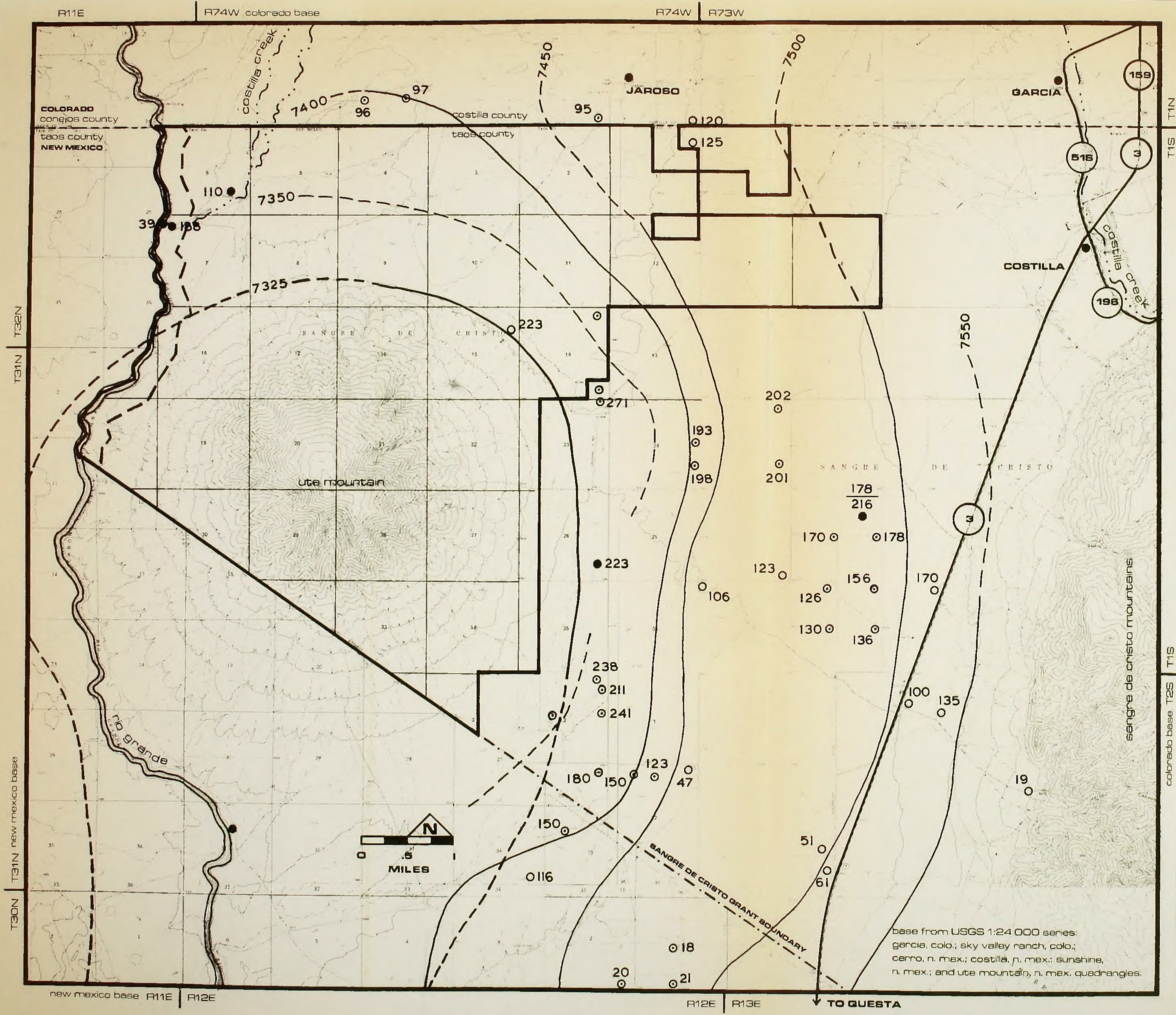
TABLE 3.4-4
MEANS AND RANGES OF WATER QUALITY PARAMETERS AS MEASURED
IN THE RIO GRANDE NEAR LOBATOS, COLORADO
(1947-1978)

| parameter | mean | minimum | maximum |
|---|---|---|---|
| Specific conductivity ( mhos/cm) | 356.0 | 150.0 | 1,010.0 |
| pH (units) | 7.8 | 6.4 | 8.8 |
| Temperature (°C) | 10.0 | 0.0 | 27.0 |
| Turbidity (JTU) | 11.0 | 1.0 | 70.0 |
| Oxygen, dissolved (mg/l) | 9.6 | 6.0 | 14.0 |
| Hardness (mg/l-$CaCO_3$) | 115.0 | 49.0 | 340.0 |
| Calcium (mg/l) | 34.0 | 15.0 | 98.0 |
| Magnesium (mg/l) | 7.1 | 3.0 | 24.0 |
| Sodium (mg/l) | 26.0 | 9.0 | 100.0 |
| Sodium adsorption ratio | 1.0 | 0.6 | 3.0 |
| Potassium (mg/l) | 4.7 | 1.7 | 11.0 |
| Bicarbonate (mg/l) | 115.0 | 34.0 | 215.0 |
| Alkalinity (mg/l-$CaCO_3$) | 95.0 | 45.0 | 176.0 |
| Sulfate (mg/l) | 72.0 | 18.0 | 320.0 |
| Chloride (mg/l) | 9.0 | 2.3 | 33.0 |
| Fluoride (mg/l) | 0.4 | 0.2 | 1.2 |
| Silica (mg/l-$SiO_2$) | 28.0 | 16.0 | 41.0 |
| Solids, total dissolved (mg/l) | 248.0 | 80.0 | 712.0 |
| Solids, total suspended (mg/l) | 29.0 | 0.0 | 315.0 |
| Nitrate (mg/l-N) | 0.12 | 0.0 | 1.0 |
| Ammonia (mg/l-N) | 0.01 | 0.0 | 0.03 |
| Phosphorus, total (mg/l) | 0.13 | 0.02 | 0.46 |
| Iron, dissolved (mg/l) | 0.051 | 0.01 | 0.12 |
| Manganese, dissolved (mg/l) | 0.035 | 0.0 | 0.13 |
| Arsenic, dissolved (mg/l) | 0.002 | 0.001 | 0.005 |
| Cadmium, dissolved (mg/l) | 0.0 | 0.0 | 0.004 |
| Chromium, dissolved (mg/l) | 0.0 | 0.0 | 0.01 |
| Cobalt, dissolved (mg/l) | 0.0 | 0.0 | 0.002 |
| Copper, dissolved (mg/l) | 0.0 | 0.0 | 0.003 |
| Lead, dissolved (mg/l) | 0.002 | 0.0 | 0.015 |
| Mercury, total (mg/l) | 0.0001 | 0.0 | 0.002 |
| Selenium, dissolved (mg/l) | 0.0 | 0.0 | 0.001 |
| Silver, dissolved (mg/l) | 0.0 | 0.0 | 0.000 |
| Zinc, dissolved (mg/l) | 0.005 | 0.0 | 0.02 |

Source: USDOI, GS 1979

### 3.4.4.2 Groundwater

Groundwater resources beneath the exchange lands occur within alluvial sediments that underlie the piedmont alluvial plain, and within lava flows



base from USGS 1:24 000 series: garcia, colo.; sky valley ranch, colo.; cerro, n. mex.; costilla, n. mex.; sunshine, n. mex.; and ute mountain, n. mex. quadrangles.

# ENVIRONMENTAL RESOURCE EVALUATION

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## WATER TABLE CONTOURS

WATER LEVEL IN FEET ABOVE SEA LEVEL. CONTOURS DASHED WHERE APPROXIMATE

7350 — WITHIN ALLUVIAL SEDIMENTS. [CONTOUR INTERVAL 50 FEET]

7325 — WITHIN ANDESITE BASALT. [CONTOUR INTERVAL VARIABLE]

NUMBER REPRESENTS DEPTH TO WATER IN WELL WHERE TWO NUMBERS SHOWN, UPPER = DEPTH TO WATER IN ALLUVIAL SEDIMENTS, LOWER = DEPTH TO WATER IN ANDESITE BASALT

| | |
|---|---|
| ⊙ 96 | IRRIGATION WELL |
| ○ 120 | STOCK / DOMESTIC WELL |
| ● 223 | DAM SITE TEST HOLE |

SOURCE:
WINOGRAD, 1959

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.6

that underlie and are interbedded with the alluvial sediments. Groundwater within these sediments is normally found at depths ranging from 50 to 270 feet, although most wells along perennial reaches of Costilla Creek encounter water within 20 feet of the surface (Fig. 3.6) (Winograd 1959). Water within the lava is typically found at depths ranging from 90 to 230 feet below the land surface (Winograd 1959). Groundwater elevations are presented on Figure 3.6. Recharge to groundwater is derived from perennial streams and related irrigation canals, direct infiltration of precipition, arroyo flood flows, and infiltration of irrigation water. Stream flow and precipitation are generally greater in the higher elevation lands east of the study area. Therefore, the most important recharge area for most groundwater resources in the study area is probably located east of the exchange lands. However, recharge from precipitation on Ute Mountain is likely an important localized source of water to underlying lava and alluvial sediments.

Most wells are dug or drilled into the alluvium sediments. These wells, which are utilized mostly for irrigation, reportedly yield from 600 to 1,200 gpm (Winograd 1959). Utilization of groundwater for irrigation occurs primarily south and east of the exchange lands and no groundwater is currently being utilized on the exchange lands.

Chemical analyses of groundwater from the alluvial sediments indicate that the groundwater is among the best in the state in chemical quality (Winograd 1959). The water is well suited for irrigation and other agricultural uses. Concentrations of total dissolved solids are reported to range from about 100 to 300 mg/l (Winograd 1959). The quality of groundwater found in the lava below the alluvial sediments is similar to the quality of water in these sediments (Winograd 1959).

### 3.4.5 Climate

The climate of western Taos County and the general area of the proposed exchange lands is semiarid, although proximity to highlands and differences in altitudes make temperatures and precipitation totals vary considerably between points. Records have been consistently maintained at Cerro, New Mexico, by the U.S. Weather Bureau. Data for Cerro are equivalent to those conditions found in the study area as they share similar terrain and altitude conditions. Cerro (altitude 7,665 feet) averages 11.54 inches of annual precipitation; 33 percent occurs in July and August and 30-40 percent occurs as snowfall. Precipitation increases in the nearby highlands at an apparent rate of 8 inches per 1,000 feet elevation increase (Winograd 1959).

Temperatures are likewise variable with altitude. The mean annual temperature at Cerro is 44.6°F, with maximum and minimum recorded temperatures (period of record 1932-55) of 98°F on August 2, 1937 and -33°F on February 8, 1933.

Generally, summer temperatures exceeding 90°F are relatively common while winter minimums may often drop to near 0°F for a few days during December through March. Summers are pleasant with warm days and cool nights while winters are long and cold. Data at Cerro indicates an average frost free season of 121 days, although six growing seasons between 1932 and 1955 had only 110 days or less and one (1945) had only 77 frost free days. Average date of the last killing frost is May 31 but has been known to occur as late as June 29 in 1945. Fall's first killing frost averages September 29 but two have occurred as early as September 9 (Winograd 1959).

Table 3.4-5 lists pertinent temperature and precipitation data at Cerro, New Mexico, for the period 1941-1970.

TABLE 3.4-5
AVERAGE MONTHLY PRECIPITATION AND TEMPERATURES
CERRO, NEW MEXICO (ALT. 7,665' MSL)
1941-1970

| | precipitation (inches) | temperature (°F) |
|---|---|---|
| January | 0.59 | 21.9 |
| February | 0.46 | 27.3 |
| March | 0.63 | 33.9 |
| April | 0.91 | 43.8 |
| May | 0.92 | 52.3 |
| June | 0.96 | 60.6 |
| July | 1.83 | 65.8 |
| August | 1.94 | 64.1 |
| September | 1.10 | 58.1 |
| October | 1.10 | 47.7 |
| November | 0.53 | 34.3 |
| December | 0.57 | 25.0 |
| Annual | 11.54 | 44.6 |

Source: National Climatic Center 1973. Asheville, NC.

## 3.4.6 Vegetation

The following discusses floral components according to three subsections representing habitat types and physiographic features of the property, namely: rangeland, river area, and Ute Mountain. A potential floral species list is given in Appendix A.

### 3.4.6.1 Sagebrush-Grassland Association (Disturbed)

The vegetative aspect for this rangeland is actually classified as Western Wheatgrass-Big Sage Association (USDA, SCS 1977) but the majority of the range is in a natural recovery process from extensive overgrazing. Because of the overgrazing the range is dominated by big sage and broom snakeweed with small percentages of grasses and palatable shrubs (0 to 20 percent). Certain areas have actually lost most or all of the topsoil from wind, and possibly water, erosion and in these areas big sage is the only vegetation present. Conversely, areas that contain slightly greater slopes or are on the flanks of Ute Mountain have recovered well and contain higher percentages of grasses (70 percent). Figure 3.7 indicates these areas. As shown on the map, the approximate relative percentages of the exchange lands in each sagebrush-grassland association are: sagebrush-grassland, 55 percent; sagebrush-snakeweed, 10 percent.

Table 3.4-6 details a portion of the rangeland plant species and their relative average abundance by groups as observed by PNM biologists (mountain and river areas are covered separately). A discussion of potential herbage production and stocking rates for livestock is contained in Section 3.7.3, Projected Land Use.

### TABLE 3.4-6
### ESTIMATED PERCENTAGE OF OCCURRENCE FOR OBSERVED PLANT SPECIES IN SAGEBRUSH-GRASSLAND ASSOCIATION

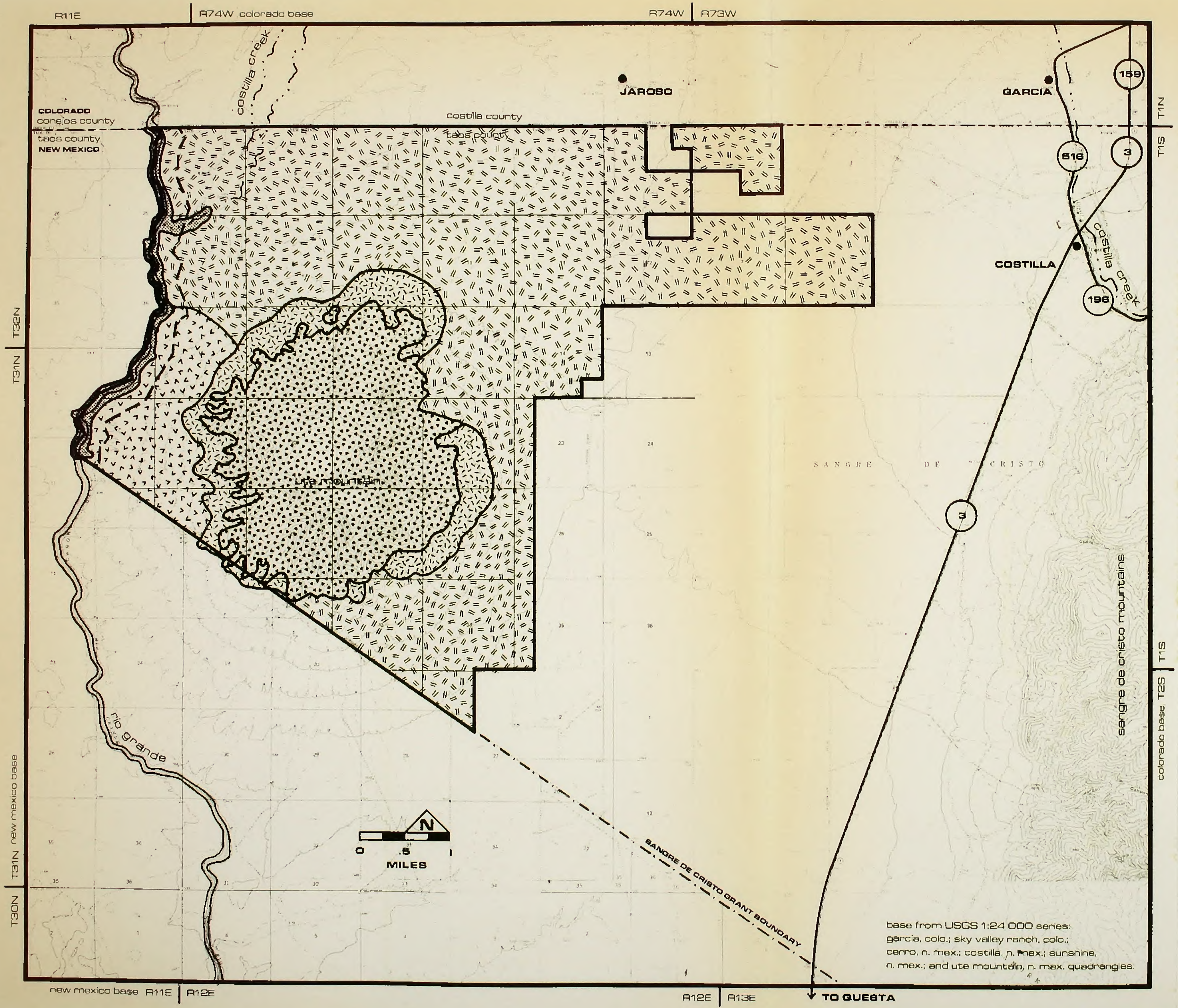
| | |
|---|---|
| Woody Shrubs | 80% |
| Big sage | 50 to 70% |
| Broom snakeweed | 5 to 20% |
| Rubber rabbitbrush | 3 to 5% |
| Four-wing saltbush | 3 to 5% |
| Winter fat | 3 to 5% |
| | |
| Grasses | 15% |
| Bluegrama | 5 to 10% |
| Indian ricegrass | 5 to 10% |
| Needle and thread | 1 to 2% |
| Galleta | 2 to 5% |

# ENVIRONMENTAL RESOURCE EVALUATION

OF THE PROPOSED

# TOP O' THE WORLD EXCHANGE LANDS

## VEGETATION TYPES



base from USGS 1:24 000 series:
garcia, colo.; sky valley ranch, colo.;
cerro, n. mex.; costilla, n. mex.; sunshine,
n. mex.; and ute mountain, n. mex. quadrangles.

▩ RIO GRANDE GORGE RIVER HABITAT

▨ SAGEBRUSH-GRASSLAND

▨ SAGEBRUSH-SNAKEWEED

▨ GRASSY SLOPES

▨ MONTANE CONIFER

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.7

| | |
|---|---|
| Bottlebrush squirreltail | 3 to 5% |
| Western wheatgrass | 5 to 10% |
| Dropseed species | 1 to 2% |
| Crested wheatgrass* | 1 to 2% |
| Three-awns species | 1 to 5% |
| | |
| Forbs | 5% |
| False buckwheat species | 1 to 3% |
| Cactus species | 1 to 3% |
| Russian thistle | 1 to 5% |
| Daisy species | 1 to 3% |
| Tansy mustard | -- |
| Golden weed | 3 to 5% |
| Fringed sage | -- |
| Summer cypress | 1 to 3% |
| Goosefoot species | -- |
| Pigweed species | -- |

*This appears as an escape from cultivation in adjacent areas.

### 3.4.6.2 Rio Grande Gorge

The Rio Grande gorge shares the dominant vegetation types with the sagebrush-grassland association. This is true on the canyon rim and along the edges where slopes are not too steep. The rim and side slopes have a higher percentage of ground cover of both grass and shrub species relative to the sagebrush-grassland. The bottom of the Rio Grande gorge is a highly disturbed river plain. The seasonal floods tend to modify the bottom vegetation such that, with the exception of a few of the more tenacious species, all of the previous year's growth is removed. River habitat vegetation comprises approximately 2 percent of the total exchange lands.

The canyon rim and edges contain many of the more palatable species of vegetation. These include: (shrubs) winter fat, big sage, mountain mahogany, and four-wing saltbush; (grasses) blue-grama, desert wheatgrass, Indian rice grasses, and various dropseed species. The shrubs and grasses along the rim and edge are in better overall condition than the sageshrub-grassland. This is because grazing animals to find it difficult to utilize the steep and rugged slopes. The shrub species appear moderately utilized by browser species.

The scouring action of the Rio Grande prevents an accumulation of vegetation into what can be termed a "riparian habitat". However some willow species and tamarisk do occur only a few feet from the river in the canyon bottom. Between the tamarisk/willows and the canyon walls, some grasses, four-wing saltbush, rubber rabbitbrush and western virgin's bower vines occur.

### 3.4.6.3 Ute Mountain

#### 3.4.6.3.1 Montane Conifer Association (Disturbed)

The dominant vegetation of Ute Mountain is in essentially seral stages; this is apparently from clear cut logging and significant fires years ago. Many of the tree species are typical of this altitude and latitude in New Mexico. The tree species in order of apparent dominances are: limber pine, Douglas fir, aspen, ponderosa, one-seed juniper, pinon pine, and white fir. Logging, probable severe moisture stress in summer, and shallow soils have produced poor quality trees. Most trees are stunted, i.e., for a tree of a given diameter at breast height (DBH), the tree will have more taper at a given height than a tree of the same species growing in a more suitable habitat. Stunting also results in a greater number of branches, and branching also occurs lower on the tree than normal. As a result, timber quality is low; PNM biologists estimate that the large number of knots and small DBH reduces the lumber quality to Grade 3 or less. Poor soil conditions and relative lack of moisture also produce elevated resin content in the trees, further reducing their commercial value.

The most common trees of commercial value on Ute Mountain are Ponderosa pine; the estimated density of commercial size Ponderosa (10" DBH) is 8/acre, covering approximately 700 acres of the mountain. Smaller Ponderosa, Douglas fir, limber pine, and white fir occur over approximately 2,500 acres, which includes the 700 acres of potentially commercial Ponderosa. These trees are post size, and often occur in dense stands. Access into the timbered areas would have to be constructed over very steep and rocky slopes.

Woody shrubs are encountered in fewer numbers than tree species. Those most noticed were dwarf juniper, kinnikinnick, and raspberry. Big sage and winterfat also occur along the steep slopes; both appeared quite heavily browsed by deer. Because of the localized distribution of shrubs, it is not possible to present any realistic approximation of percent occurrence. Overall, montane-conifer habitat covers approximately 35 percent of the exchange lands.

Grasses are restricted to the more moderate slopes; this vegetation type covers approximately 7 percent of the exchange lands. The restricted nature of grasses is due is in part to the shallowness of soils and the movement of talus on the steeper slopes. The northern side of the mountain has the best grass covers, including Indian ricegrass, blue grama, and sand dropseed on the lower slopes. The middle and upper slopes have good coverage of grasses and grass-like species. These include pine dropseed, Western wheatgrass, mountain muhly sedge spp., blue grass spp., blue grama, Thurber fescue, and other grasses.

### 3.4.7 Wildlife

The following description of the faunal components on the exchange lands are divided into three subsections which represent the habitat types in the area. These habitat types correspond to either the physiographic features or the vegetative community in which they occur. A potential faunal species list covering all habitat types may be found in Appendix B.

#### 3.4.7.1 Sagebrush-Grassland (Disturbed)

Typical faunal components of the Great Basin Desert are found in this habitat type. The inclusion of the grassland feature creates a satisfactory habitat for the pronghorn antelope; according to the New Mexico Department of Game and Fish, a herd of thirteen individuals is found on or near the exchange lands. (Rickman 1979). This herd appears to be composed of two subgroups, one of which utilizes an area west of Ute Mountain and north into Colorado (three to five individuals). Bedding sites were noted immediately to the west of Ute Mountain along the Rio Grande and a high use area was seen just south of Costilla Creek. The remaining animals are located immediately south of Ute Mountain.

Other mammals which were identified as occurring or have the potential of occurring in the area include: badger, striped skunk, desert cottontail rabbit, white and blacktail jackrabbits, bats, least and Colorado chipmunks, rock squirrel, mice, Ord's kangaroo rat, coyote, and foxes.

The avifaunal components are also typical of the Great Basin Desert formation with influences from both the mountains and the Rio Grande. Some of the more common birds include: scaled quail, horned lark, western meadowlark, vesper sparrow, song sparrow, and magpies.

Reptiles and amphibians which may be encountered in the sagebrush-grassland include: prairie rattlesnake, black-tailed rattlesnake, bull snake, and spiny lizard. The plains spadefoot toad could occur as one of the few amphibians in this area.

### 3.4.7.2 Rio Grande Gorge

Faunistically, the bottom of the Rio Grande gorge is semi-depauperate due to the lack of consistent year-round habitat; this habitat is seasonally removed by the flooding of the river. The sides and rim of the gorge, however, support a diverse abundance of animal species.

The steep slopes of the canyon afford a plentiful supply of browse for mule deer; as indicated by the bedding areas and tracks, a small herd (of unknown size) utilizes the area. The New Mexico Department of Game and Fish Comprehensive Management Plan delineates the Rio Grande as occupied range for mule deer of the Sangre de Cristo herd. No doubt the herd size fluctuates widely depending on season and the availability of food here and in other areas.

The sides of the gorge also support the following mammals which may or may not derive their existence from the plains above or the river below: bats, chipmunks, ground squirrels, rock squirrels, mice, coyote, raccoon, badger, striped skunk, bobcat, and fox.

Birds which are found along the canyon include both permanent and seasonal migrantes. A number of raptor use-sites were identified along the western side of the gorge. It is suspected that these sites may be used by golden eagles, great horned owls, prairie falcons, and others. The gorge sides should provide nesting sites for other species also. Although the gorge does not support waterfowl nesting sites, it does furnish habitat during migration; this aspect is illustrated by the observation of twelve common mergansers on the river during field studies.

Reptiles and amphibians are also abundant along the sides, rim, and bottom of the canyon. The basalt rocks provide suitable habitat for many snakes and lizards including: prairie rattlesnake, New Mexico and western terrestrial garter snakes, bull snake, southern plateau lizard, sagebrush lizard, desert short-horned lizard, and many-lined skink. Toads and frogs include: plains spadefoot toad, Rocky Mountain toad, and leopard frog. Tiger salamanders may possibly be found along the river.

The Rio Grande has long been noted as supporting native populations of Rio Grande cutthroat trout, an important game species. Additional stockings of brown trout, rainbow trout, and northern pike have resulted in the Rio Grande being one of the more important fisheries in New Mexico. Other fish found in these waters include: white sucker, Rio Grande shiner, and longnose dace.

### 3.4.7.3 Ute Mountain

Ute Mountain is essentially an isolated, island-type mountain supplying only a limited amount of habitat for mule deer and, to a more limited extent, elk. The primary reason is that the mountain itself is dry; it has no year round sources of surface water. Although the mountain is only 1.5 miles from the Rio Grande, the distance is great enough to limit the elk usage to winter, when snow supplies most of their water needs. Elk utilizing the mountain migrate from the nearby Sangre de Cristo Mountains in the late fall and return in late winter or early spring. The deer herd is small (ca. 40 individuals) and probably fluctuates with varying habitat conditions. Evidence suggests the mountain receives some small amount of hunter pressure but statistics for hunter success are not available.

Other mammals which are found on Ute Mountain include: porcupine, coyote, bobcat, striped skunk, foxes, mice, rock squirrels, red squirrels, chipmunks, and eastern cottontail rabbits.

Some of the more common avifauna include: Clark's nutcracker, Steller's jay, pinon jay, common flicker, hairy woodpecker, mountain chickadee, and the grey-headed junco. The raptors utilizing the mountain are discussed in Section 3.5.1.2.

Certain reptiles are no doubt found on the mountain. These should include: blacktail rattlesnake, bull snake, and spring lizard.

### 3.4.8 Limiting Factors

#### 3.4.8.1 Flood Plains

Neither flood plains nor flood hazard areas are reported to exist on the exchange lands (USHUD 1979).

#### 3.4.8.2 Fault Zones

Faulting was the major process in shaping the Sunshine Valley area, creating the mountain highlands and maintaining the physiographic outline of the Rio Grande trough. Faulting is widely evidenced in the county, including upfaulted lava flows, the bold western face of the Sangre de Cristos and in particular the triangular facets, fault scarplets, and landslides associated with the mountains. Local evidence is also found on San Pedro Mesa, which lies close to the western mountain face near Costilla, New Mexico. The mesa is capped by lava flows believed to be the same as those underlying the piedmont plateau, which, with certain assumptions, indicates the minimum uplift along the mountain front at 2,100 feet; most of this is assumed to have occurred since volcanic activity ceased.

Evidence of continuing uplift along the mountain front is indicated by a fault scarplet, as shown on Figure 3.3. The scarplet trends just east of north, is 1.5 miles long, and tapers off rapidly from a height of 30 feet above the surrounding landscape.

#### 3.4.8.3 Avalanche Areas

No avalanche areas have been identified within the proposed exchange lands.

#### 3.4.8.4 Adjacent Subdivisions

Previous subdivision developments within the exchange lands are discussed in Section 3.1.4.

Current subdivision development comes within one mile of the northern boundary (Section 3.6).

#### 3.4.8.5 Industrial Plants

Two active gravel pits are located three to four miles east of the exchange lands along NM-3. A sawmill occupies a former gravel pit just south of the main road to the Top o' the World Farms headquarters (Figure 3.10).

#### 3.4.8.6 Buffer Zone

The scenic easement discussed in Section 3.1.5 would provide a buffer zone to the Rio Grande Wild River. It is the only existing or planned buffer zone associated with the exchange lands.

### 3.4.9 Visual Resources

The exchange lands contain three distinct landscape units: the sagebrush-grassland plain, the Rio Grande gorge, and Ute Mountain. Sensitivity levels are associated with NM-3, two to six miles east of the eastern edge of the study area, and the Rio Grande Wild River area.

#### 3.4.9.1 Scenic Quality

A sagebrush-grassland plain comprises the majority of the exchange lands. This is a piedmont alluvial plain forming at the base of the Sangre de Cristo Mountains. The land has a gentle roll in a generally level landform. Arroyos and ephemeral creeks cross the plains. With the exception of Costilla Creek, they form only a minor depression in the landform. Costilla Creek has eroded through the plateau to join the Rio Grande some 120 feet below. The plain is dominated by big sage and broom snakeweed (see Section 3.4.6.1) with small percentages of grasses and shrubs. Textures and colors are even with little contrast. Soils are light, shrubs are chalky greens, grasses range from light green to light ochre. Patches of false buckwheat add a localized but strong red to the landscape. Strong value (light to dark), chroma (color), and lineal contrasts are provided by the irrigated farmlands adjoining the exchange lands. The level plain continues north along the western slope of the Sangre de Cristos up into the San Luis Valley in Colorado and south to the Red River and Cabresto Creek. A pattern of graded roads associated with Rio Grande Estates and Sunshine Valley Estates are still in the process of revegetation. They are primarily noticeable from the air. Abandoned buildings and irrigation ditches and a minor amount of trash dumping, primarily in the northeast portion of the exchange lands, are minor intrusions on the basically natural landscape. Unimproved roads, as indicated on Figure 3.10, are the only other notable modifications.

The Rio Grande gorge is a 120-foot cut snaking its way along the western edge of the exchange lands. Vegetative species are similar to the plains but are interpersed among the basaltic boulders lining the gorge. Some willows and saltcedars grow along the floor of the gorge but regular scouring by the Rio Grande prevents much accumulation. The sediment-laden Rio Grande dominates the gorge. It reflects the steepness of the sides and the intensity of the sky back to the viewer. The dark basaltic rocks contrast sharply with the grey-greens, ochres, yellows, reds, and tans of the vegetation. Seasonal changes add much variety. Once in the gorge, viewing ranges are confined to the gorge. From the plains, particularly from the air or Ute Mountain, the gorge adds a striking lineal element to the landscape. The gorge begins about six miles north of the Colorado state line and gradually deepens to about 1,200 feet deep at Embudo about three miles south of the southern Taos County line. The gorge is natural in character with the only distinct intrusion, an old building and some corrals, north of the state line. A primitive camping area where Costilla Creek joins the Rio Grande has no human signs, probably a factor of regular scouring by the river.

Ute Mountain is one of several extinct volcanoes dotting the plateau between the Sangre de Cristos on the east and the San Juan, Conejos, and Jemez mountains on the west. This conical peak rises to 10,093 feet, some 2,500 feet above the surrounding plain. Conifers are interspersed with aspens and these forest stands are interspersed by montane meadows. This mixture adds value, chroma, and texture contrasts. Water sources are absent from the mountain. Colors range from the light tans and greens of grasses and yellows and whites of aspens, to the dark browns of soils and dark greens of the conifers. Seasonal patterns add further variety. The random natural patterns of the mountain contrast interestingly with the very geometric patterns of the adjacent farmlands. Ute Mountain is one of four mountains of similar visual character in the area: San Antonio Peak, Cerro de la Olla, and Guadalupe Mountain. San Antonio Peak and Ute Mountain, because of their height and the nature of their surroudings, are visual elements in the landscape for a considerable distance: 35 miles to the north and 44 miles to the south. A couple of unimproved roads extend partially up the base of Ute Mountain; they are minor modifications. Also, evidence of logging operations (stumps and tops) dating back some 30 to 50 years may be seen on the northern slopes; this aspect is a negligible modification in the landscape.

### 3.4.9.2 Sensitivity Levels

NM-3 is the major travel route in the area of the exchange lands. The 1979 ADT just south of the exchange lands was 1,011. Views extend across the plain and focus on Ute Mountain, which falls in background viewing range.

The BLM permitted 576 people in the 1979 season for use of the upper reaches of the Rio Grande Wild River area. Because no one is regularly present to issue permits, 576 permits refect only a fraction of the actual use (Speegle 1979). Viewing ranges within the gorge are confined to the gorge.

### 3.4.10 Cultural Resources

A preliminary assessment of the potential for cultural resources on the exchange lands was conducted through a literature review, consultations with the New Mexico State Historic Preservation Officer, State Archeologist, other professionals of broad experience, and a limited field reconnaissance.

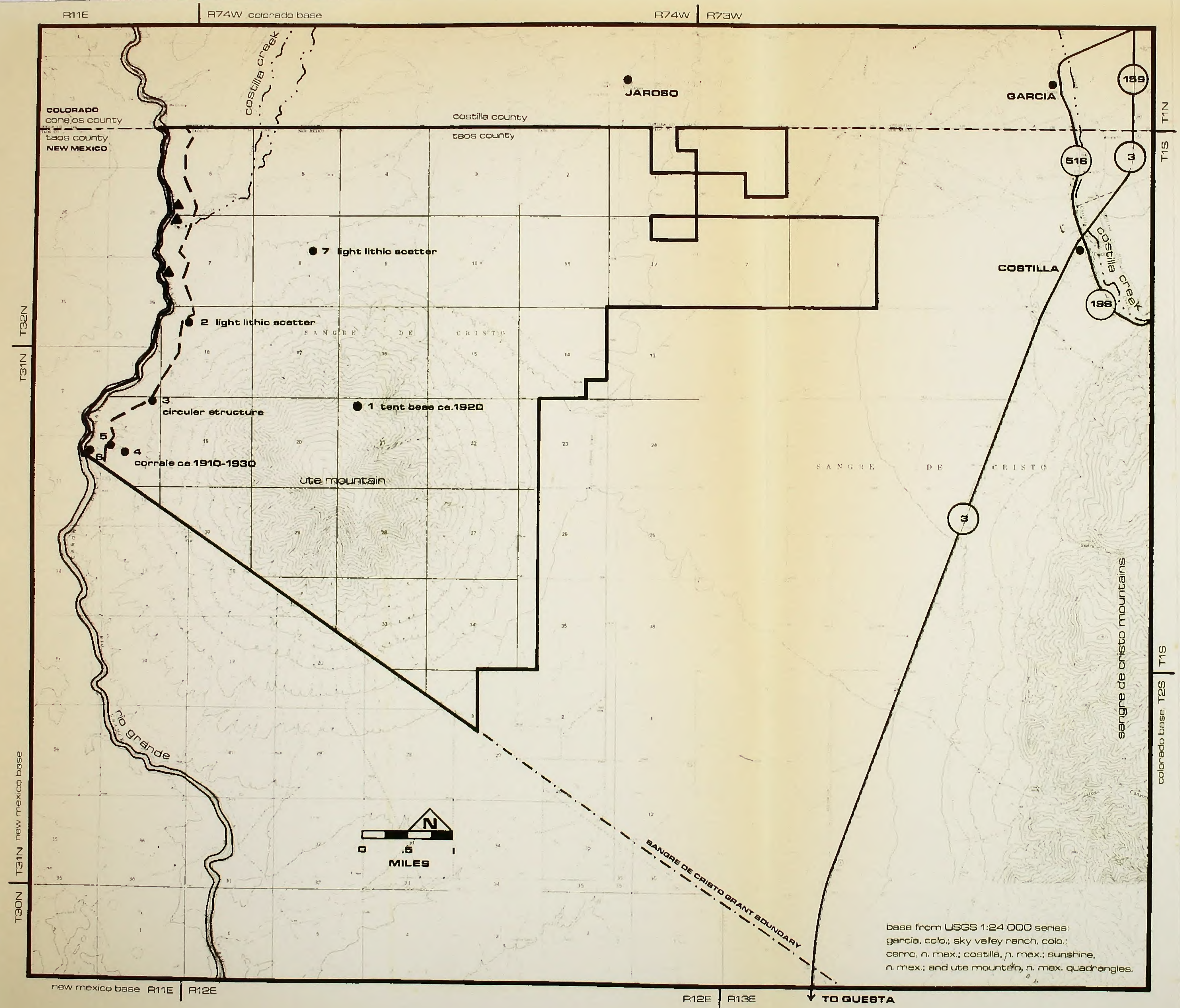
In comparison with other regions of New Mexico, the existing literature on the Questa/Costilla region is very limited. The most recent known work in the region is a linear survey conducted by the School of American Research (Schaafsma 1977), near Questa, New Mexico. Schaafsma has provided a bibliography on the region which includes: Herold 1968; Mera 1935; Renaud 1942; Schaafsma 1975, 1976, 1977; and Wendorf and Reed 1955. Of these sources, two may mention sites on or near the exchange lands. Mera notes that puebloan sites are found a "short distance below the Colorado line," (Mera 1935:7, in Schaafsma 1977:4); and Wendorf and Reed mention a cave site on the Rio Grande near the Colorado line (1955:135, in Schaafsma 1977:4).

In summarizing the known cultural resources of the region, Schaafsma finds that, "hunter-gatherer sites (of the time before A.D. 400) are present and are likely to be more common than the later pueblo sites," (Schaafsma 1977:4).

Mr. Thomas W. Merlan, New Mexico State Historic Preservation Officer (SHPO), reports that there are no properties present on or near the exchange lands that are currently listed on the National or State Registers of Historic Places. In addition to the SHPO, state archeologist, and the Laboratory of Anthropology records center, the following experts were consulted for personal knowledge of the region: Mr. David Brugge, National Park Service; Dr. Linda S. Cordell, University of New Mexico; Mr. Charles R. Morrison, Bureau of Land Management; Mr. Stewart Peckham, Laboratory of Anthropology; and Mr. Ben Phillips, Bureau of Land Management. The consensus of these sources is that no systematic survey has taken place on or close by the exchange lands, and that present knowledge of the region is spotty.

With this background, a limited reconnaissance of the area was conducted on October 26 and 27, 1979, by Charles H. Carroll, archeologist for the Public Service Company of New Mexico, accompanied on October 26 by Mr. Ben Phillips, Compliance Archeologist, BLM, Albuquerque office. The objective of the reconnaissance was to provide a preliminary assessment of the types of cultural resources which may be present; no systematic sampling was attempted.

Three distinct habitat zones are present on the exchange lands and each was checked in the field. These are the slopes and flanks of Ute Mountain, the high sagebrush-grassland plains surrounding the mountain, and the rim and riverine community of the Rio Grande gorge. However, due to difficult access and limited time, the southern slopes and lower ridges of Ute Mountain could not be investigated while in fact this may be one of the more likely areas for the presence of cultural resources. A local informant gave the archeologists an anecdotal account of circular features on the south side of the mountain, but this was not a direct report and it is impossible to determine if the features are depressions (i.e., pithouses) or surficial structures. In view of Site 3 reported below, it may be likely that this account describes similar surface masonry structures. Identified sites are shown on Figure 3.8.



base from USGS 1:24 000 series:
garcia, colo.; sky valley ranch, colo.;
cerro, n. mex.; costilla, n. mex.; sunshine,
n. mex.; and ute mountain, n. mex. quadrangles.

# ENVIRONMENTAL RESOURCE EVALUATION

OF THE PROPOSED

# TOP O' THE WORLD EXCHANGE LANDS

## CULTURAL RESOURCES

- ● ARCHEOLOGICAL SITES
- ▲ CAIRNS

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.8

### 3.4.10.1 Archeological Sites

The reconnaissance began with a helicopter overview of the study area and a check of the top and highest clearings of Ute Mountain. The mountain top was specifically checked for evidence of Native American religious activity and no recognizable features were found. Historic trash and very reduced structure remnants (observed on the ground by PNM biologists) are present on the mountain top, and additional trash and a small structure remnant was recorded as Site 1, in a clearing mid-way on the north slope. Site 1 consists of a D-shaped feature of one course of native masonry and light logs. The feature measures approximately 2m x 1.5m and may represent a tent base. Two poles nearby with wire attached may represent a tent bipod or tripod. On the basis of associated trash, the two structural remains encountered on the mountain are probably associated with logging in the period of about 1900-1925. This conforms with the opinion of biologists that the mountain was heavily logged in the past. A single obsidian flake with bifacial retouch was observed by biologists near the summit of Ute Mountain and it is likely that hunting and gathering sites occur in uninvestigated areas. These would not be expected in great density, however, and will probably be limited in composition to light lithic scatters.

The reconnaissance of the lower mountain ridges and shrub plains centered primarily on the zone between the Rio Grande and the west slopes of Ute Mountain. In this zone, physiographic situations which typically reveal archeological sites in other regions were inspected; at this gross level, at least, the expected pattern of site distribution seems to hold for the study area.

Sites 2 and 7 consist of very light, nondiagnostic lithic scatters, located on gravel ridges which are probably of Pleistocene origin and which are presently exposed by weathering. Lithic materials consist mainly of a specific variety of local basalt (ubiquitous along the basalt rim of the Rio Grande) which is notably light, fractures fairly well, and generally exhibits tiny glassy inclusions. About 20 percent of the material observed consisted of a dull white to gray chert. No obsidian was found in the shrub-plains zone. Both Sites 2 and 7 consist of scatters of fewer than 30 unmodified flakes.

Site 3 is located in the shrub-plains zone, on a unique physiographic feature of uplifted basalt (probably a reduced core) which overlooks both the high plains and the Rio Grande gorge, about 1/4 mile to the west. This site may represent one of the more significant classes of sites to be found in the study area. The primary feature of the site is a circular structure base of cobble-size basalt, approximately 2m in diameter and with 40cm standing walls of about three courses of unshaped native masonry. A 50cm opening in the structure wall faces east. Associated cultural material consisted of a basalt, D-shaped, bifacially retouched scraper or knife, and a hand-made but well executed shell button, ca 23mm in diameter by 3mm in thickness. The structure is located about 20m from the crest of the low hill, on about the center of the leeward (eastern) slope. A second structure of similar construction, but employing *in situ* boulders as a west wall may be present about 3m downslope and 3m north of the structure. This feature is filled level with washed and blown in sand and may or may not represent a structure.

A third possible structural feature is present at the southeastern base of the hill on a relatively level washed area. This consists of an approximately 150 degree arc of a single course of basalt cobbles which would form about a 2.5m circle if complete. This feature may represent a tipi ring, but this is uncertain. However, the center of the arc is clear of basalt cobbles which are common in the surrounding area.

Four man-made rock piles are present along the NE-SW trending ridge of the hill. The largest of these is located at the northern crest of the hill. This is approximately 2m in diameter by 50cm in central depth, with a second 1m diameter rock pile immediately adjacent on the west. The elements are large cobble-size basalt, with no apparent pattern or function. No evidence of burning was observed and the configuration does not readily suggest ovens, sweat lodge stones (elements are too large), nor collapsed cairns. A third rock pile, ca 1m in diameter by 30cm in depth is located at the central crest of the hill and a fourth of this size is present at the southern extreme of the hill top.

While no cultural or temporal affinity can be assumed for these features (nor contemporaneity), it can be suggested that on the basis of the nature and depositional situation of the remains that they originated in the late prehistoric or early historic periods, and are not associated with more recent historic evidence occurring at the northeast base of the topographic feature. The first structure described above exhibits the classic form and construction of Navajo hogan bases, as extensively recorded to the west and south. This observation has met mixed reviews from the experts consulted and the further investigation of this site, and the possibility of similar sites rumored to be located on the southern flanks of Ute Mountain is certainly warranted.

Whether this site originated with Navajos, Utes, or one or more of the many plains and northern tribes who probably passed through the region in annual trading rounds (Ewers 1955), it is likely that on the basis of potential scientific contribution, this site is qualified for nomination to the National Register of Historic Places.

The recent historic site noted above is located adjacent to the site hill on the northeast and consists of a hollowed-log animal feed trough (probably a mineral feeder for sheep) and associated glass and metal trash, probably dating to the 1950s through 60s. A basalt boulder wall section, approximately 2m long with an original height of about 75cm is located on the north extreme of the trash scatter on the plain below the hill and, on the basis of weathered surfaces of the small basalt boulders used, is probably associated with recent activity rather than the earlier components of Site 3.

Sites 4, 5, and 6 are associated with sheepherding, with the sites dating from about 1900 through 1930 on the basis of limited associated trash. Sites 4 and 5 are irregularly shaped corrals of unshaped basalt masonry. Both are about 15m by 10m in size with meandering walls of approximately 1m in original height.

Site 6 is an extensive corral complex within an arroyo cut in the caprock of the Rio Grande gorge at the southern extreme of the current property boundary. Three corrals are present and numerous isolated wall segments which have probably been altered by rebuilding. A very definite switch-back trail has been cleared from the site to the river bottom about 100 feet below. The trail results from clearing massive amounts of basalt debris from an area about 1.5 to 2m wide and stacking to form a substantial "curb" on the downslope side. Purple iodine glass associated with this site probably dates to 1910-1920.

Several rock piles, which are probably collapsed cairns, were observed by biologists along the rim of the Rio Grande gorge in the vicinity of Costilla Creek. These were not directly observed by archeologists, but are suspected to mark trails to the river bottom.

### 3.4.10.2 Summary

On the basis of the limited reconnaissance it appears that the predominate site type of prehistoric and early historic Native American origin to be found within the study area will be lithic materials associated with hunting and butchering, in the form of isolated artifacts and light scatters, and dating potentially from the PaleoIndian period (ca 10,000 years before present) through the late 19th century A.D. A striking aspect of the Rio Grande gorge and surrounding high plains is that the situation would seem excellent for jump strategies to be employed on large game. That is, a potentially fatal drop to the gorge bottom, with numerous points and extentions along the gorge rim where game could be driven and forced over. While the potential for such sites appears high along much of the northern Rio Grande, none have ever been recorded--possibly because the river has periodically removed the evidence.

No extensive lithic sites (i.e., in the hundreds of flakes category with hearths, etc.) were found as are fairly common in the Archaic period, but these might well be revealed by a systematic survey and some definable evidence of Archaic activity in the area seems virtually certain.

Evidence might also be found of Puebloan occupation, which is suggested by Mera (1935) and Schaafsma (1976), although this was not encountered in the reconnaissance and Puebloan activity might be transient rather than localized.

The historic period appears to be well represented in the archeological record and a systematic survey would undoubtedly record a substantial inventory. Early historic and possibly late prehistoric sites of Native American origin have been recorded and these could result from Apachean, Ute, plains, or northern tribes passing through or occupying the area seasonally. The historic European occupation of the late 19th and early 20th century is more heavily represented, and would be equally significant to any study of cultural transition in the region.

### 3.4.10.2 Recommendations for Future Study

The proposed exchange lands and the immediately surrounding region form a void in archeological knowledge, but clearly not in the archeological record. This reconnaissance and the few recent clearance surveys in the region have all confirmed the presence of fairly extensive cultural resources, representing a variety of cultural adaptations which are poorly understood at present. Therefore, rather than present general problems of cultural adaptation to be addressed through application of archeological data, it is more appropriate at this phase to recommend that a systematic survey of the region be undertaken to ascertain the cultural variability present and the perceived patterning of the archeological record as a basis for the development of testable theory specific to regional problems. With the potential for evidence of human activity spaning the full range since occupation of the New World, the potential for relevant research is equally expansive.

Specific recommendations can be offered for approaching the historic European sites. Nondestructive archeological techniques, literature review, and ethnohistoric techniques could be employed to evaluate the significance of these sites and address questions of cultural transition and adaptation in the evolving regional and national economic systems. For example, it is likely that large-scale sheep herding occurred in this area as in other northern New Mexico areas such as around Raton. The developing ties of this region in the 19th and early 20th centuries to the Rocky Mountain, Californian, and Mid-western market systems are significant in terms of both economic growth and resource destruction from wide spread overgrazing. Analysis of this aspect of modern history would be amenable to the techniques of cultural energetics in addition to those suggested above.

In addition to this line of investigation, specific attention should be given to the evaluation of "the old headquarters" for its potential significance as a state or federal historic property. This was described by a local informant as the ruins of the original ranch headquarters (assumed to mean after the area entered private ownership). It was logistically impossible to locate or investigate the site during the reconnaissance, but this site should be evaluated in terms of any significant role in local or regional history.

### 3.4.11 Recreation

The western edge of the exchange lands, the Rio Grande gorge, is currently an active recreation area. The exchange lands overall have several types of potential recreation: continued river sports and associated camping; hunting, picnicking, and other dispersed activities around Ute Mountain; and wilderness recreation. Wilderness recreation will be discussed in Section 3.4.12.

Forty-eight miles of the Rio Grande, from the Colorado border south, and the lower four miles of the Red River were included in the 1968 Wild and Scenic Rivers Act. The act provides for a national river system to preserve the "scenic, recreational, geologic, fish and wildlife, historic and cultural values." Numerous river related activities are associated with the Rio Grande Wild River area: hiking, sightseeing, camping and picnicking, wildlife, fishing, floating, artistic expression, and history. The wild river adjoining the exchange lands is class II river running water: very wild; intermediate run; beautiful small canyon; portage out of canyon required (220 vertical feet). Permitted use on the upper reaches of the wild river (from the state line south to Arroyo Hondo) for 1979 was 576 user days (USDOI, BLM n.d.-b). Actual use was probably much higher. Private use accounted for 219 user days or 38 percent. Commercial use accounted for 357 user days or 62 percent. "Water yield fluctuates significantly from year to year. During the preceeding ten years, the river has offered a runnable season about 50 percent of the time.... Even during "good" water years, the season may be only six to eight weeks long, due to high irrigation withdrawals in Colorado" (USDOI, BLM n.d.-b). Informal primitive camping and an occasional take-out point for river runners occurs northwest of Ute Mountain where Costilla Creek joins the Rio Grande. The most common take-out point for this section of the river, and the one recommended by the BLM, occurs at Lee Trail, 24 miles south of the state line. The common put-in point is Lobatos Bridge, eight miles north of the state line.

Once the exchange lands are open to the public, potential for hunting exists. Although limited in numbers, hunting could include the following game species:

antelope
deer
elk
squirrel

dove
duck
geese
pidgeon
quail

Species abundance is further discussed in Section 3.4.7.

### 3.4.12 Wilderness

Because the exchange lands have been in private ownership for the past several years, no wilderness inventories have been conducted on them. The lands abut the wild and scenic river which abuts a BLM wilderness inventory unit which will be discussed in Section 3.6. If the exchange is consumated, the exchange lands could be incorporated with the adjacent Windmill Unit (NM-010-033). Ute Mountain and some of its surroundings exhibit the wilderness qualities of naturalness, solitude, and primitive and unconfined recreation which the BLM will want to inventory.

## 3.5 Mandatory Items

### 3.5.1 Endangered, Threatened, or Sensitive Plants and Animals and Their Habitats

#### 3.5.1.1 Threatened and Endangered Fauna

Threatened and endangered fauna were not oberved during field work on the exchange lands during October 24-25, 1979. Locality records of the New Mexico

Department of Game and Fish show that nine threatened and endangered species are known to occur in Taos County. No information from Colorado authorities was gathered or used in this study. No recorded sightings of the nine New Mexico species are listed for the study area, however, they are addressed because the remoteness, physiognomic features, and habitats present the potential opportunity for use by these species. Additionally, when discussing threatened and endangered species, it is necessary to include information on surrounding areas of influence that can affect decisions on management potential and interpretation of potential uses of an area.

Table 3.5-1 lists threatened or endangered faunal species that have the potential to occur on the exchange lands and/or the immediately surrounding areas.

TABLE 3.5-1
POTENTIAL THREATENED AND ENDANGERED FAUNAL SPECIES

| | |
|---|---|
| Marten | State (group II) |
| Black-footed ferret | Federal/state (group I) |
| Mink | State (group II) |
| River otter | State (group I) |
| Bald eagle | Federal/state (group I) |
| Osprey | State (group I) |
| Peregrine falcon | Federal/state (group I) |
| Sage grouse | State (group I) |
| Whooping crane | Federal/state (group I) |

[1] State group I = federal endangered
State group II = federal threatened

Source: Adapted from Findley, et al. 1975, Hubbard 1978, and Hubbard, et al. 1978.

Table 3.5-2 provides information on general locality records for Taos County, habitat preference, areas of potential use and critical habitat for threatened

TABLE 3.5-2

POTENTIAL THREATENED AND ENDANGERED FAUNA--TOP O' THE WORLD EXCHANGE LANDS
LOCALITY, HABITAT PREFERENCE, AND CRITICAL HABITAT DESIGNATION

| | locality records for Taos County (or surrounding areas) | habitat preference | primary area of potential use | critical habitat designation |
|---|---|---|---|---|
| Marten<br>(Martes americana origenes) | NE Taos in Carson National Forest, unverified records in Sangre de Cristos north of Taos | spruce fir and alpine forests | Ute Mountain | not applicable |
| Black-footed ferret<br>(Mustela nigripes) | not applicable | grassland and shrub communities | the plain (sagebrush) | not applicable |
| Mink<br>(Mustela vison energumenos) | near Alcade and near Velarde-Rio Arriba County; near Costilla Creek (Sangre de Cristo Mountains) | wide variety of habitats and always near water | Ute Mountain, the plain, Rio Grande gorge | not applicable |
| River Otter<br>(Lutra canadensis sonora) | unverified siting near Rio Arriba/Taos County line--Rio Grande | rivers, streams | Rio Grande gorge | not applicable |
| Bald eagle<br>(Haliaeetus leucocephalus) | several unverified sitings along Rio Grande gorge in south Taos County | rivers, lakes | Rio Grande gorge | not applicable |
| Osprey<br>(Pandion haliaetus carolinensis) | several unverified sitings along Rio Grande gorge in south Taos County | rivers, lakes | Rio Grande gorge | not applicable |
| Peregrine falcon<br>(Falco peregrinus anatum) | unverified siting southwest of Taos | cliffs and near water | Ute Mountain and Rio Grande gorge | not applicable |
| Sage grouse<br>(Centrocercus urophasianus) | questionable siting near Taos; verified siting west of Rio Grande | sagebrush | the plain (sagebrush) | not applicable |
| Whooping crane<br>(Grus americana) | not applicable | marshes, lakes, pools | Rio Grande gorge | Not applicable (Bosque del Apache) |

Source: Adapted from Findley, et al. 1975, Hubbard 1978, and Hubbard, et al. 1978.

or endangered species. It is thought that four species are more likely to occur on the exchange lands than the remaining five. The four are bald eagle, osprey, peregrine falcon and whooping crane. The eagle and osprey would probably be limited to the Rio Grange gorge, whereas the peregrine could potentially use the entire area. The whooping crane could occur in the area along the Rio Grande. Use of the area by those four birds would likely be greatest during migratory periods. Peregrine falcons might occur in the area yearlong. It is unlikely that they currently utilize the area as a breeding site.

The marten, black-footed ferret, mink, river otter, and sage grouse have locality records in Taos County but are probably too rare to be found in the study area. The marten is extremely rare and New Mexico is at the southernmost end of its distribution. Most verified records for the black-footed ferret are prior to 1960 and are from the west-central portion of the state (Valencia and McKinley Counties). Likewise, the mink has a pattern of verified records prior to 1960 and has probably experienced a serious population decline in New Mexico. The only recent verified record of the river otter is the Gila River (Grant County) in 1953. The sage grouse is known only from the Tres Piedras area, although native populations used to occur in the Tierra Amarilla area and an introduced population once occurred near Taos. The potential should be evaluated for the management of introduced sage grouse on the sagebrush flats. Ligon (1961) indicates that the area is of marginal suitability for the bird.

The common feature to these five species is that New Mexico constitutes a southern end to their distribution. Thus, any populations present would be in a marginal portion of the range, greatly reducing the likelihood of occurrence and management potential on the exchange lands (except possibly the sage grouse).

### 3.5.1.2 Birds of Prey

Birds of prey are also discussed in Section 3.4.7. The purpose of this section is to present results of field observations along the Rio Grande gorge during October 24-25, 1979. The gorge was observed on those two dates in order to determine bird activity and use of the west wall (primarily east facing). The west facing (or east) wall was not studied. Characteristics of the wall bordering the river provide suitable roost and nest sites for hawks, eagles, falcons, owls, and ravens. The entire west wall was viewed and sites of use/nesting were recorded.

A single red-tailed hawk was observed flying along the rim of the west wall apparently hunting approximately 1/2 mile north of the southwest boundary of the exchange lands. Two prairie falcons were also observed; one approximately 1/2 mile south of the Costilla Creek/Rio Grande junction on October 24, while the other (possibly the individual observed on October 24) was seen flying the rim of the west wall 1/3 mile north of the Costilla Creek/Rio Grande junction on October 25. A single female marsh hawk was observed flying the sagebrush/ snakeweed flats at the southwest boundary of the exchange lands.

Twelve "raptor use" points were observed on the west wall of the Rio Grande gorge. One site might be a golden eagle nest; other sites were difficult to designate as being associated with a particular species. Field verification during the breeding season would be necessary to determine which species use a particular site. Other raptors that could be expected to use the Rio Grande gorge for nesting are the common raven, great-horned owl, prairie falcon, and red-tailed hawk.

Table 3.5-3 indicates the raptors that could potentially utilize various parts of the study area, as identified by PNM raptor experts. Not all owls are included due to a lack of information.

TABLE 3.5-3
RAPTORS THAT PROBABLY OCCUR IN EXCHANGE LANDS AREA

| | status | area of primary potential use of ranch |
|---|---|---|
| Goshawk | migrant | Ute Mountain |
| Sharp-shinned hawk | summer | Ute Mountain |
| Cooper hawk | yearlong | Ute Mountain |
| Red-tailed hawk | yearlong | entire area |
| Swainson hawk | migrant/summer | sagebrush plain |
| Rough-legged hawk | migrant/winter | sagebrush plain |
| Ferruginous hawk | yearlong | sagebrush plain |
| Golden eagle | yearlong | entire area |
| Bald eagle | migrant/winter | Rio Grande gorge |
| Osprey | migrant/summer | Rio Grande gorge |
| Prairie falcon | yearlong | sagebrush plain and Rio Grande gorge |
| Peregrine falcon | yearlong | Ute Mountain and Rio Grande gorge |
| Merlin | migrant | Ute Mountain |
| American kestrel | yearlong | entire area |
| Marsh hawk | migrant/winter | sagebrush plain |
| Barn owl | summer | Ute Mountain and Rio Grande gorge |
| Screech owl | winter | Ute Mountain and Rio Grande gorge |
| Great-horned owl | yearlong | Ute Mountain and Rio Grande gorge |
| Common raven | yearlong | entire area |

### 3.5.1.3 Endangered, Threatened, Rare, and Unique Flora

The Department of the Interior, U.S. Fish and Wildlife Service, at present lists no endangered or threatened species of vegetation for the exchange lands or the immediate vicinity. A list of plant species is currently under review by the New Mexico Native Plant Protection Advisory Board (NMNPPAB). The NMNPPAB is a recognized group of authorities who are considering plant species, either proposed or to be proposed, for listing as federal endangered species. Additionally the state of New Mexico is expected to pass legislation affording a protective status to the species proposed by the NMNPPAB.

Currently the NMNPPAB has developed a tentative list of species that have a potential for listing either as federal or state endangered. The most recent list (October 1979) delineates some vegetative species which could be found in the study area; to date, none of these plants have been located.

It is important to note that the NMNPPAB list is only tentative. All, none, or some portion of the plants on this list may eventually be afforded a protective status. Many of the plant species on this list are there only because no information exists for them. Many of the plants have confused taxonomies, and in some cases more than one scientific name has been applied to the same plant. These problems will eventually be resolved by the state authorities.

Plants identified by the NMNPPAB as occurring in north-central New Mexico that may be found in the study area include the following (note that at present common names do not exist for most of these species):

Lycopodiaceae
    *Lycopodium annotinum* L.

Orchidaceae
    *Listera cordata* (L) R. Br. var. *nephrophylla* (Rydb.) Hulten

Ranunculaceae
    *Delphinium alpestre* Rydb.

Cruciferae
    *Draba stenoloba* var. *nana* (Schulz) Hitchc.
    *Draba aurea* Vahl. var. *neomexicana* (Greene) Tidest.

Leguminosae
    *Astragalus cyaneus* Gray
    *Astragalus puniceus* Osterh. var. *gertrudis* (Green) Barneby
    *Trifolium brandegei* Wats.

Saxifragaecae
    *Parnassia fimbrata* Konig.
    *Saxifraga caespitosa* L.
    *Saxifraga cernua* L.
    *Saxifraga flagellaris* Willd. ssp. *platysepala* (Trantv.) Porsild.

Violaceae
    *Viola selkerkii* Pursh.

Cornaecae
    *Cornus canadensis* L.

Serophulariaceae
    *Castillega lauta* no authority given

### 3.5.2 Cultural Resources

No properties presently listed in the National Register of Historic Places, or the New Mexico State List of Historic Properties are located within the study area. However, sites encountered during a limited reconnaissance indicate that both prehistoric and historic archeological remains exist within the study area which may be eligible for nomination to national or state register status. These sites and the likelihood of additional cultural resources are discussed in Section 3.4.10.

Since the proposed action involves no form of land alteration, no direct effect upon cultural resources eligible for inclusion in the National Register of Historic Places is forseen. The possibility of indirect effect as a result of increased public access to the area is anticipated; appropriate management procedures should be taken to minimize this form of impact.

### 3.5.3 Flood Plains and Flood Hazard Evaluations

Neither flood plains nor flood hazard areas are reported to exist on the exchange lands (USHUD 1979).

## 3.6 Ownership and Land Use on Adjoining Lands

Ownership and Land Use maps (Figures 3.9 and 3.10, respectively) visually portray this information. The following discussions will provide additional detail.

Beginning approximately one mile north of the exchange lands, 33,919 acres east of the Rio Grande are being developed as the Rio Grande Ranches. Approximately 55 percent of the 6,630 five-acre lots have been sold throughout the country since the development started in 1971 (Holgvin 1979). Similar developments dot the San Luis Valley.

The settlement of Jaroso is approximately one mile north of the exchange lands in Colorado. It is an active but dispersed residential/agricultural community. No commercial facilities were either listed in the area's phone book or were noted from a helicopter survey.

The northeastern portion of the exchange lands abut the Rio Costilla Cooperative Livestock Association, a cooperative of 182 families with holdings of approximately 88,000 acres; most holdings are east of NM-3. Much of their holdings are being managed for grazing and some disking and seeding has been taking place for the last ten years. They are working with the U.S. Department of Agriculture's Great Plains Agricultural Program. They are also in the study phase of a ski development (section 2.3) and there is a possibility a landing strip would be developed to serve the ski area. A possible location would be the cooperative's holdings west of NM-3 (Gonzales 1979).

Paragon Resources, Inc., a wholly owned subsidiary of PNM, owns the 3,150.892-acre Top o' the World Farms adjacent to the eastern side of the exchange lands. The farm was established in the early 1950s. Lettuce, carrots, and potatoes were grown. At one time the farm boasted of having the largest individually owned potato storage cellar in the world. In 1979, 11 circular fields, irrigated with electric, center-pivot spray rigs, produced 2,100 acres of barley (80-85 bushels/acre) and 21 acres of alfalfa. The area around the circles is being planted in crested wheat; 300 acres have been planted as of this writing. Barley will continue to be the primary crop with certified alfalfa and grass seeds as secondary crops (Sonnier 1979).

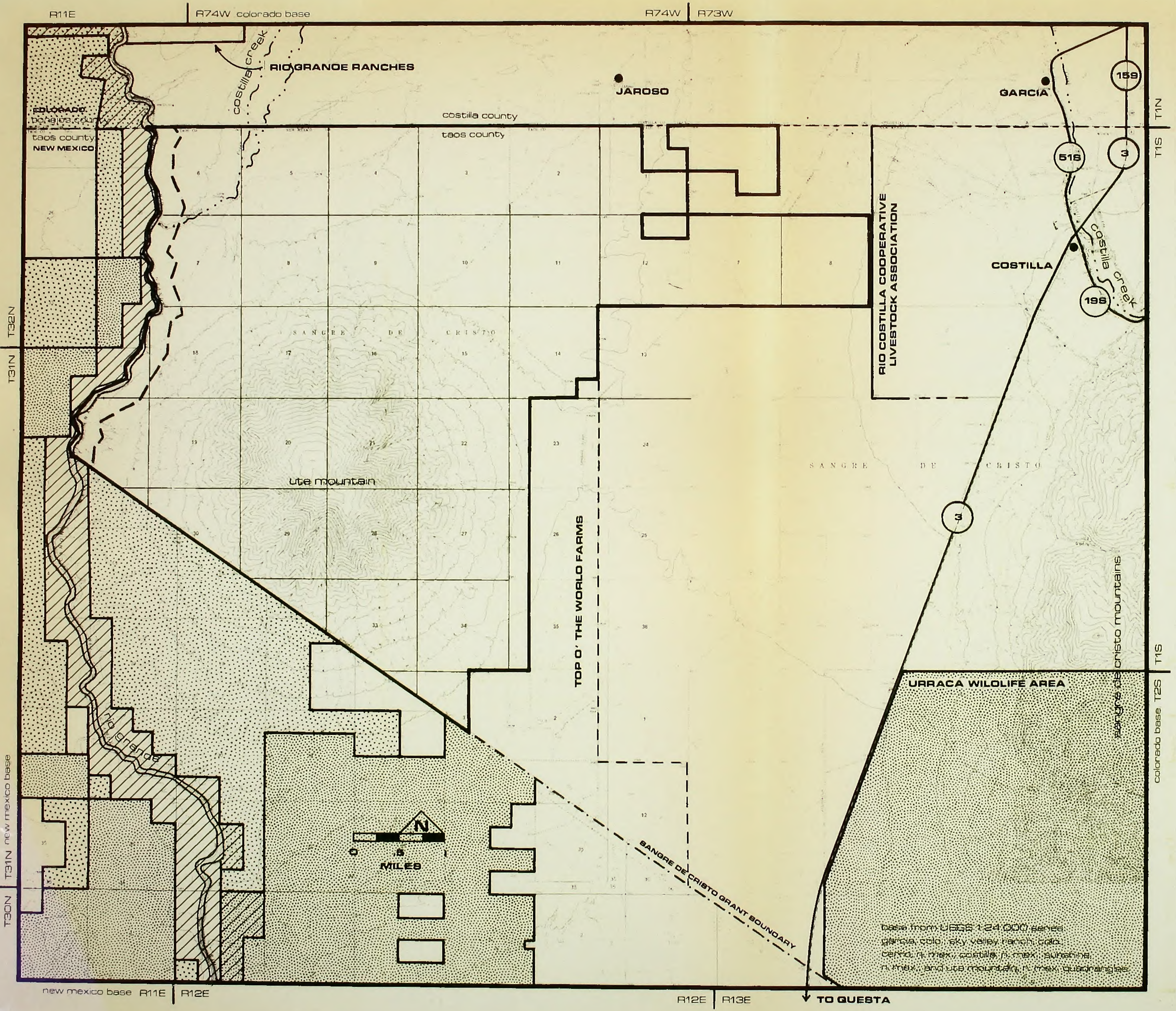
East of the farmland are other active farming operations interspersed with fallow fields and grazing parcels. Barley or alfalfa are grown with an emphasis on barley. Small agricultural tracts line NM-3.

# ENVIRONMENTAL RESOURCE EVALUATION

OF THE PROPOSED

# TOP O' THE WORLD EXCHANGE LANDS

## LAND OWNERSHIP



base from USGS 1:24,000 series
garcia, colo., sky valley ranch, colo.,
cerro, n. mex., costilla, n. mex., sunshine,
n. mex., and ute mountain, n. mex., quadrangles

□ PRIVATE

▒ STATE

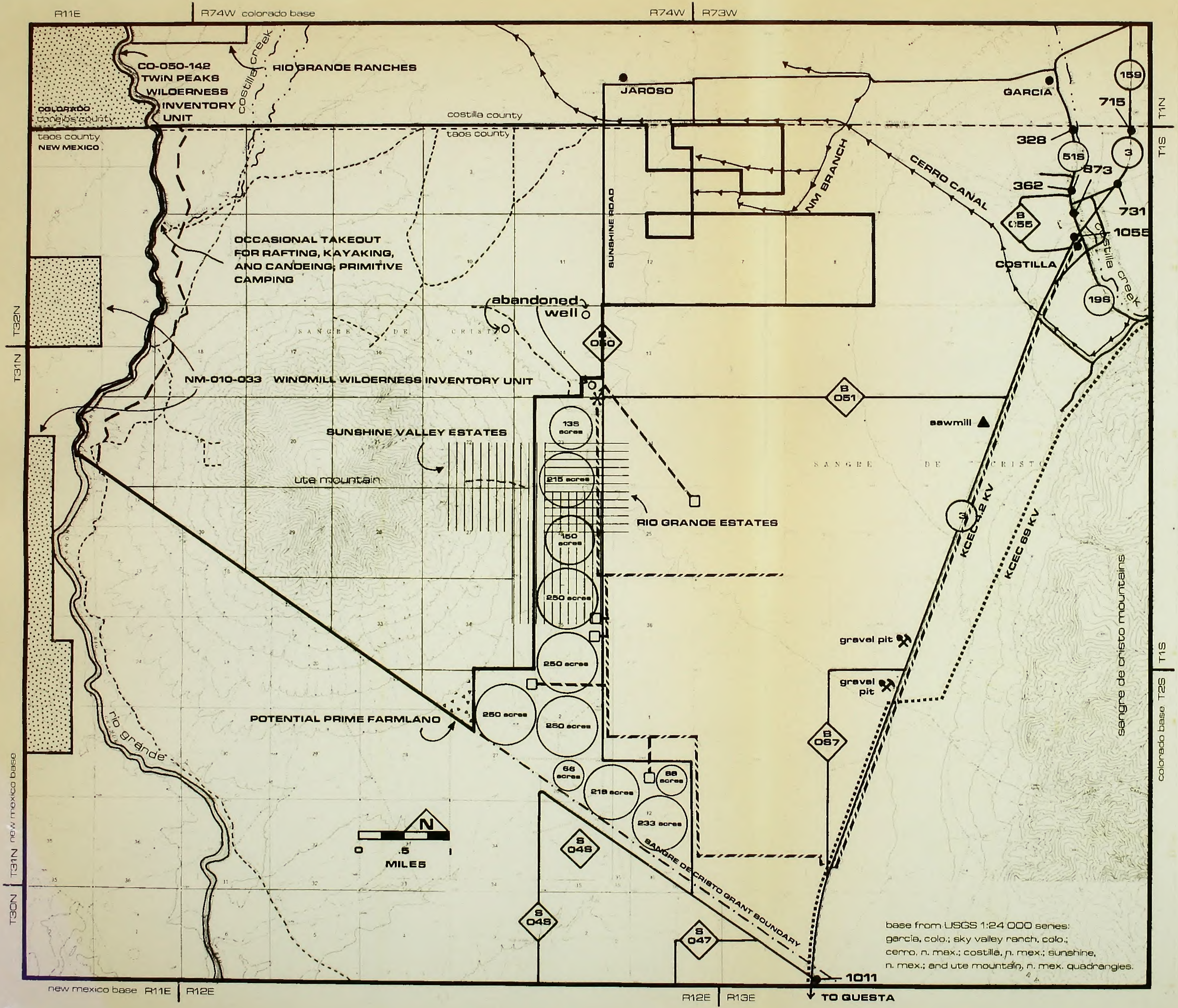
░ BLM

▨ POWER SITE WITHDRAWAL

SOURCES:
USDOI 1977
NMDGF 1979

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.9



base from USGS 1:24 000 series:
garcia, colo.; sky valley ranch, colo.;
cerro, n. mex.; costilla, n. mex.; sunshine,
n. mex.; and ute mountain, n. mex. quadrangles.

# ENVIRONMENTAL RESOURCE EVALUATION

OF THE PROPOSED

# TOP O' THE WORLD EXCHANGE LANDS

## LAND USE

54 STATE ROAD

873 COUNTY ROAD
nm: 1979 maintained
colo: county designated

------ UNIMPROVED ROAD

········ ELECTRIC TRANSMISSION LINE

ELECTRIC DISTRIBUTION LINE AND TRANSFORMER

UNDERGROUND ELECTRIC DISTRIBUTION LINE

○ IRRIGATED AREA

328 AVERAGE DAILY TRAFFIC

SOURCE:
KCEC 1979
USDOI BLM 1979
NMSHD 1979

PUBLIC SERVICE COMPANY
OF NEW MEXICO 1979

FIGURE 3.10

Two BLM wilderness inventory units adjoin the exchange lands on the west (Figure 2.1). They are the Windmill Unit (NM-010-033) (9,600 acres) and the Twin Peaks Unit (CO-050-142) (3,200 acres). These are gently rolling shortgrass and sagebrush plains. Public input supported the areas as biologically important, containing significant wildlife values. The contiguous New Mexico and Colorado units will remain in the inventory process to determine if one or both areas contain wilderness characteristics (USDOI, BLM 1979).

## 3.7 Land Use Capabilities of Subject Land

### 3.7.1 Historic Uses

The exchange lands lie in the southwest corner of the former 1,038,195-acre Sangre de Cristo land grant. The land grant was approved in 1844, after being applied for by Charles Beaubien in the names of his twelve year old son Narciso and an employee, Stephen Luis Lee. (Charles Beaubien was a French-Canadian trapper from Quebec who became a naturalized Mexican citizen in 1831). In partnership with Guadalupe Miranda, Beaubien also applied for and obtained the 1,750,000-acre Beaubien and Miranda grant which borders the Sangre de Cristo Grant on the east; today, this grant carries the name of his son-in-law, Lucien B. Maxwell. The two holders of the Sangre de Cristo grant were murdered in the 1847 Taos Rebellion, whereupon the Beaubien half of the grant reverted to Narciso's father, Charles. Beaubien also purchased Lee's portion for $100 to pay off Lee's outstanding debts (Armstrong 1978). Several interests in the grant were then given by Beaubien to various children and their spouses, beginning a long history of subdividing the grant.

In 1854, the U.S. Congress created the office of Surveyor General of New Mexico to meet obligations required by the Treaty of Guadalupe-Hidalgo in terms of property rights of Mexicans. The surveyor was to ascertain the "origin, nature, character, and extent" (Act of July 22, 1854, 10 Stat. 308) of land claims and submit his recommendations to Congress. If Congress decided to confirm the claim, a survey would be made and a patent issued. Claims were confirmed from 1854 to 1879 and included the Sangre de Cristo grant on June 21, 1860 (White et al. 1971) (Armstrong 1978).

The land was divided, sold, reunited, and divided once more. The second division broke the million-acre ranch into the Trinchera Estate and the Costilla Estate. The latter encompassed approximately the southern half of the grant and was sold in 1870 to a group of Dutch investors. Through the following years, the Costilla Estate was broken up, sold and resold, divided and redivided, with few large tracts remaining intact (Armstrong 1978). In 1942, eight incorporators started the Rio Costilla Cooperative Livestock Association. They own approximately 88,000 acres of the New Mexico portion of the former Costilla Estate; in the late 40s and early 50s they also owned the exchange lands (Gonzales 1979).

### 3.7.2 Present Uses

Unimproved roads wind across the main body of exchange lands and two county maintained roads border the northeast portion. An abandoned ditch, a portion of the New Mexico Branch of the Cerro Canal, also crosses the northeast portion (Sonnier 1979). Another abandoned ditch generally parallels Sunshine Road. A few old stone house foundations are found on the property, primarily east of Sunshine Road. Two abandoned wells are also on the exchange lands; are irrigation and one stock well.

There are no active land uses associated with the exchange lands with the exception of four antelope permits. Infrequent unauthorized wood gathering occurs on Ute Mountain.

### 3.7.3 Projected Land Use

The recreation and wilderness potentials are discussed in Sections 3.4.11 and 3.4.12. Potential prime farmland and grazing are the only other projected land uses.

Approximately 80 acres of the Fernando Clay Loam soil series, located in the southeast corner of the exchange lands, are considered to be (with irrigation) prime farmland.

> "It is SCS policy to make and keep current an inventory of the prime farmland and unique farmland of the nation . . . The objective of the inventory is to identify the extent and location of important rural lands needed to produce food, feed, fiber, forage, and oil seed crops . . . Prime farmland is land that has the best combination of physical and chemical characteristics for producing (the previously listed) crops and is also available for these uses. It has the soil quality, growing season and moisture supply needed to economically produce sustained high yields of crops when treated and managed . . ." (USDA, SCS 1979).

In terms of grazing, the exchange lands are basically conprised of a grassland-shrub mixture characterized by short and mid-grasses. Low shrubs are at least as common as grasses and share the dominance of the area. Annual forbs and grasses occur in relative abundance during the spring months in years with above average growing conditions. This plant community will change under adverse conditions. Most commonly, a marked increase will occur in the amounts of shrubs and perennial forbs, mainly big sagebrush and snakeweed. Correspondingly, a decrease will be seen in palatable species of grasses.

The exchange lands are an example of poor range management practices extending from the early part of this century probably into the 1940s. The range itself has not been grazed for some time, and is currently in a condition that indicates a fair return to original conditions. The Soil Conservation Service lists an average total annual herbage production for this type of range as 600 pounds/acre (USDA, SCS 1977). From field observations, this range probably does not exceed an average of 500 pounds/acre.

Table 3.7-1 lists SCS recommended initial stocking rates for acres per animal unit month (AUM). These rates should be applied to the exchange lands only after actual range conditions are determined from further field observations.

TABLE 3.7-1
SUGGESTED INITIAL STOCKING RATES
(acres per animal unit month)

| | range condition | | | |
|---|---|---|---|---|
| | excellent | good | fair | poor |
| favorable years | 6 | 7 | 9 | 14 |
| unfavorable years | 10 | 13 | 15 | 26 |

Source: USDA, SCS 1977

## 3.8 Land Use Analysis

The following is intended to summarize the salient land use implications resulting from BLM's acquisition of the proposed exchange lands.

BLM's land use objectives will be well served by acquiring the proposed exchange lands, according to the BLM's Rio Grande Management Framework Plan. The acquisition of Ute Mountain is desirable both for its unique natural values and to serve as a land buffer for the Rio Grande Wild River (USDOI, BLM n.d.-a). BLM owns the land parcel immediately south of the property, which includes most of the lower, southern flank of Ute Mountain; hence, acquisition of the proposed exchange lands would give BLM complete control over both the present and future use of Ute Mountain, and the last significant portion of private land bordering the Rio Grande Wild River.

Acquisition would aid BLM in developing and administering an important land component with ties to several BLM programs, including: the Rio Grande Wild River, adjoining BLM wilderness inventory units immediately west of the Rio Grande and consistent multiple use management of the exchange lands themselves in relation to other adjacent and nearby BLM owned lands.

BLM control of the proposed exchange lands also brings the potential for adversely affecting the environmental resources on the exchange lands. The major cause of adverse impacts would be the increased usage of the area by the public. Manifestations of increased public use include damage to soils, vegetation, and wildlife from ORV's and the simple additional presence of men and machines in a relatively unspoiled area, possible damage or destruction of cultural resources (both identified and as yet undiscovered), increased littering, and demand for and implacement of user facilities.

The exchange would very likely be well received by both local residents and recreationists from outside the area. The comments received from local people when asked for an informal opinion concerning possible public ownership of the property were generally favorable. The idea of opening up the land for public usage, including hunting, ORV use, and provision of access points to the Rio Grande Wild River were all mentioned as positive benefits of BLM ownership. While some members of the public may resent the additional encroachment by the federal government as a landowner in the area, a majority would probably be in favor of the increased public accessability afforded by BLM ownership.

Currently, no federal, state, county, or local planning would be adversely affected by the proposed BLM acquisition. In fact, the opposite is true, at least in terms of federal planning. Also, Taos County is currently working on producing a substantive county general plan; no known aspect of the plan would be adversely affected by the exchange. Indeed, for some time the emphasis of land use planning in general has been to maximize retention of agricultural/ grazing lands and open space; the proposed exchange would ensure the BLM's ability to retain the present flavor of the exchange lands in perpetuity, thereby preserving the openness and pristine qualities of the property.

No other concerns of significant importance or immediacy are known to hinge on the proposed exchange; socially and economically, the BLM's management policy would in all probability be designed to essentially maintain the status quo in terms of how the lands are to be managed and used. One noteworthy new possibility is that BLM may choose to lease the area for grazing purposes; although the land is not especially productive for grazing at present, some additional economic benefit would derive to local ranchers should BLM grazing leases be brought into force. The proposed exchange would in no way affect the extent or productivity of adjoining or nearby farming/grazing operations.

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ATTACHMENT 1

# WARRANTY DEED

PUBLIC SERVICE LAND COMPANY, a New Mexico corporation,

for consideration paid, grants to:

PUBLIC SERVICE COMPANY OF NEW MEXICO,
a New Mexico corporation whose
address is P. O. Box 2267, Albuquerque,
New Mexico, as to an undivided fifty
percent (50%) interest; and

FRANKLIN LAND & RESOURCES, INC. a
New Mexico corporation, whose address
is Post Office Box 6, 215 North Stanton
Street, El Paso, Texas 79940 as to an
undivided fifty percent (50%) interest;

the following described real estate in Taos County, New Mexico:

A certain tract of land near Costilla, Taos County, New Mexico, described as part of the westerly portion of the Sangre de Cristo Land Grant and also described as Sections 7, 8 and part of Section 6, Township 1 South, Range 73 West, part of Sections 1 and 12, all of Sections 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28, 34, 35, and part of Sections 29, 30, 32, and 33, Township 1 South, Range 74 West, all of Section 2, and part of Sections 3, 4, 11, 12 and 13, Township 2 South, Range 74 West, of a private survey for the Costilla Estates Development Company by T. C. McPherson, as shown on a Map of Sectionizing filed in the Taos County Courthouse on May 11, 1920; and further described by metes and bounds as follows:

Tract A

Beginning at the SW corner of the Sangre de Cristo Land Grant, a 1943 USGLO brass cap monument found; thence West 368.0 feet to Point 1 on the centerline of the Rio Grande, thence upstream along the centerline of said Rio the following meander courses;

N. 01° 48' E., 901.0 feet to Point 2; thence;
N. 38° 00' E., 680.5 feet to Point 3; thence;
N. 19° 43' W., 926.6 feet to Point 4, thence;
N. 38° 29' E., 1824.2 feet to Point 5, thence;
N. 64° 26' E., 2034.9 feet to Point 6, thence;
N. 35° 45' E., 274.4 feet to Point 7, thence;
N. 04° 57' E., 627.9 feet to Point 8, thence;
N. 42° 05' E., 1020.2 feet to Point 9, thence;
N. 12° 17' E., 983.0 feet to Point 10, thence;
N. 11° 51' E., 1195.3 feet to Point 11, thence;
N. 65° 01' E., 420.4 feet to Point 12, thence;
N. 71° 54' E., 127.7 feet to Point 13, thence;

N. 23° 22' E., 408.3 feet to Point 14, thence;
N. 29° 19' W., 613.7 feet to Point 15, thence;
N. 00° 08' E., 657.0 feet to Point 16, thence;
N. 38° 52' W., 306.3 feet to Point 17, thence;
N. 44° 02' W., 354.6 feet to Point 18, thence;
N. 17° 56' E., 242.3 feet to Point 19, thence;
N. 36° 55' E., 372.2 feet to Point 20, thence;
N. 25° 23' W., 1085.5 feet to Point 21, thence;
N. 10° 54' E., 1063.2 feet to Point 22, thence;
N. 25° 30' E., 687.4 feet to Point 23, thence;
N. 28° 31' E., 302.2 feet to Point 24, thence;
N. 52° 15' E., 236.6 feet to Point 25, thence;
N. 10° 24' W., 1157.3 feet to Point 26, thence;
N. 22° 55' W., 1151.6 feet to Point 27, thence;
N. 00° 35' W., 768.2 feet to Point 28, thence;
N. 13° 31' E., 254.7 feet to Point 29, thence;
N. 00° 04' W., 855.2 feet to Point 30, thence;
N. 35° 57' E., 454.5 feet to Point 31, thence;
N. 25° 34' E., 215.4 feet to Point 32, thence;
N. 21° 51' E., 574.8 feet to Point 33 on the New Mexico Colorado State Line, thence leaving the centerline of the Rio Grande along the state boundary line;
N. 89° 55' E., 250.0 feet to the 147 + 70.58 mile marker, a 1925 U.S. Government brass cap monument set in concrete found, thence;
N. 89° 55' E., 4655.2 feet to the 147 mile marker, a 1925 U.S. Government brass cap monument set in concrete found, thence;
N. 89° 58' E., 5364.9 feet to a Scribed Stone found for the 146 mile marker, thence;
N. 89° 52' E., 5279.6 feet to a 2 inch iron pipe found for the 145 mile marker, thence;
N. 89° 55' E., 5280.0 feet to the 144 mile marker, a 1928 U.S. Government brass cap set in concrete found, thence;
N. 89° 42' E., 5191.5 to the 143 mile marker, a 1928 U.S. Government brass cap set in concrete found, thence;
S. 88° 24' E., 431.0 feet to the 142 + 75 mile marker, a 1928 U.S. Government brass cap monument set in concrete found, thence leaving the New Mexico Colorado State Line;
S. 00° 09' W., 2644.4 feet to a scribed stone 1/4 corner found, thence;
S. 00° 12' E., 7919.8 feet to a 1/2 inch rebar set, thence;
S. 00° 01' E., 4279.7 feet to a point, thence West;
S. 89° 47' W., 976.3 feet to a point, thence South;
S. 00° 01' E., 976.3 feet to a point, thence West;
S. 89° 47' W., 2286.3 feet to a point thence South;
S. 00° 01' E., 5295.2 feet to a 1/2 inch rebar set thence;
S. 00° 01' E., 5274.2 feet to a 1/2 inch rebar set thence;
S. 00° 01' E., 5274.2 feet to a 1/2 inch rebar set thence;
N. 89° 56' W., 3513.7 feet to a 1/2 inch rebar set thence;
S. 00° 04' W., 3657.6 feet to the South East corner of the tract thence;

Beginning at a point, the northeast corner of this tract, from whence a 1943 U.S.G.L.O. brass cap monument found for the closing corner between Section 36, Township 31 North, Range 12 East, N.M.P.M. and Section 1, Township 30 North, Range 12 East, N.M.P.M. bears S. 55° 41' E., 1136.3 feet, thence;
S. 00° 12' E., 721.1 feet to a 1/2 inch rebar set, thence;
N. 55° 52' W., 10,860.3 feet to a point, thence;
N. 55° 51' W., 2,006.4 feet to a 3/8 inch rebar found, thence;

North, 765.6 feet to a point on the southerly boundary of the Sangre de Cristo Grant, from whence a 3/8 inch rebar found as a witness corner bears South 23.3 feet, and from whence the 5 1/2 Mile Marker, a 1943 U.S.G.L.O. brass cap monument found bears N. 55° 41' W., 1,610.9 feet, thence along said Grant line;
S. 55° 41' E., 12,889.7 feet to the point and place of beginning, containing 181.557 acres, more or less, according to Plat of Survey by James D. Crowl, Land Surveyor, N.M.L.S. #5213, dated February, 1975.

Tract B
Beginning at the 142 mile marker, a 1925 U.S. Government Brass Cap Monument set in concrete found on the New Mexico-Colorado state line, thence along said state line;

S. 89° 52' E., 5292.2 feet to the 141 mile marker, a 1925 U.S. Government Brass Cap Monument set in concrete, thence;
S. 89° 52' E., 267.5 feet to a 1/2 inch rebar set, thence leaving said state line;
S. 00° 20' E., 3949.1 feet to a 1/2 inch rebar set, thence;
S. 89° 59' W., 2660.3 feet to a 1/2 inch rebar set, thence;
N. 00° 08' W., 1301.8 feet to a 1/2 inch rebar set, thence;
S. 89° 47' W., 2596.6 feet to a 1/2 inch rebar set, thence;
N. 00° 11' W., 1488.8 feet to a 1/2 inch rebar set, thence;
S. 89° 52' W., 1349.1 feet to a 1/2 inch rebar set, thence;
N. 00° 09' W., 1176.0 feet to a 1/2 inch rebar set on the New Mexico-Colorado State line; thence along said state line;
N. 89° 33' E., 1034.2 feet to the point and place of beginning, containing 435.947 acres, more or less.

Tract C
Beginning at the 142 + 75 mile marker, a 1925 U.S. Government Brass Cap Monument set in concrete found on the New Mexico-Colorado state line, thence along said state line

N. 55° 40' W., 1646.3 feet to the 5 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 45' W., 270.3 feet to the closing corner between Sections 21 and 28, Township 31 North, Range 12 East, N.M.P.M., a 1943 USGLO brass cap monument found, thence;
N. 55° 32' W., 2218.5 feet to the 4 1/2 mile marker, a 1943 USGLO brass cap monument found thence;
N. 55° 36' W., 2619.3 feet to the 4 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 47' W., 1330.2 feet to the closing corner between Sections 20 and 21, Township 31 North, Range 13 East, N.M.P.M., a 1943 USGLO brass cap monument found, thence;
N. 55° 46' W., 1328.2 feet to the 3 1/2 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 46' W., 2005.3 feet to the closing corner between Sections 17 and 20, Township 25 North, Range 12 East, N.M.P.M., a 1943 USGLO brass cap monument found, thence;
N. 55° 56' W., 654.0 feet to the 3 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 56° 19' W., 2332.5 feet to the closing corner between Section 17 and 18, Township 31 North, Range 12 East, N.M.P.M., a 1943 USGLO brass cap monument found, thence;
N. 54° 40' W., 338.4 feet to the 2 1/2 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 51' W., 2670.4 feet to the 2 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 28' W., 2656.6 feet to the 1 1/2 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 28' W., 724.7 feet to the closing corner between Section 18, Township 31 North, Range 12 East, N.M.P.M. and Section 13, Township 31 North, Range 11 East, N.M.P.M., a 1943 USGLO brass cap monument found, thence;
N. 56° 09' W., 54.2 feet to the closing corner between Sections 13 and 12, Township 31 North, Range 11 East, N.M.P.M., a 1943 USGLO brass cap monument found, thence;
N. 55° 23' W., 1882.2 feet to the 1 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 16' W., 2645.9 feet to the 1/2 mile marker, a 1943 USGLO brass cap monument found, thence;
N. 55° 17' W., 1858.3 feet to the closing corner between Sections 11 and 12, Township 31 North, Range 11 East, a 1943 USGLO brass cap monument found, thence;
N. 55° 17' W., 792.7 feet to the point and place of beginning, containing 17,307.328 acres, more or less.

LESS & EXCEPT the following described tract:

A certain tract of land near Costilla, Taos County, New Mexico, located within Sections 26, 27, 35 and 36, Township 31 North, Range 12 East, New Mexico Principal Meridian:

N. 89° 33' E., 2596.0 feet to a point from whence a 1/2 inch rebar set as a witness corner bears N. 74° 32' E., 62.9 feet distant, thence leaving said state line;
South 2660.5 feet to a 1/2 inch rebar set, thence;
N. 89° 50' E., 1321.3 feet to a point, thence;
N. 89° 40' E., 1295.9 feet to a 1/2 inch rebar set, thence;
S. 88° 00' E., 60.5 feet to a 1/2 inch rebar set, thence;
S. 00° 13' W., 2608.6 feet to a 1/2 inch rebar set, thence;
S. 89° 11' W., 2655.9 feet to a scribed stone 1/4 corner found, thence;
S. 00° 03' E., 1315.0 feet to a 1/2 inch rebar set, thence;
N. 89° 51' E., 2613.9 feet to a 1/2 inch rebar set, thence;
N. 01° 43' E., 1346.8 feet to a 1/2 inch rebar set, thence;
N. 89° 55' E., 2630.3 feet to a point, thence;
N. 89° 49' E., 2637.1 feet to a 1/2 inch rebar set, thence;
S. 89° 38' E., 2643.9 feet to a scribed stone 1/4 corner found, thence;
N. 89° 49' E., 2640.3 feet to a 1 1/2 inch iron pipe found, thence;
S. 00° 09' E., 5279.9 feet to a 1 1/2 inch iron pipe found, thence;
S. 89° 48' W., 5266.4 feet to a point, thence;
S. 89° 48' W., 5309.7 feet to a point, thence;
S. 89° 54' W., 5231.2 feet to a 1/2 inch rebar set, thence;
N. 00° 12' W., 7917.8 feet to a scribed stone 1/4 corner found, thence;
N. 00° 09' E., 2644.4 feet to the point and place of beginning, containing 2317.725 acres, more or less.

Tracts A, B and C are described on a plat of survey prepared by Rio Grande Surveying Service in February 1977, Survey No. 74-203-B, as amended by survey number 77-1193 prepared in October, 1977, both prepared by James D. Crowl, land surveyor, NMLS NO. 5213. Tract A further was reduced by 21,881 acres in the S.E. corner of Section 14, Township 1 South, Range 74 West.

Subject to patent reservations and exceptions of record and taxes for the year 1978 and subsequent years.

Subject to all oil, gas and other minerals heretofore reserved or conveyed to others by predecessors in title including reservation in the Rio Costilla Cooperative Livestock Association of a non-participating 1/4 undivided interest in and to the oil, gas and minerals lying upon or beneath the surface of the above described property; and subject to a reservation of 3/8 mineral interest in and under and that may be produced from the above described property, together with the right of ingress and egress for the purpose of mining, drilling and exploring for oil, gas and other minerals and removing the same therefrom in A.K. McMillan; and rights of way for roads, ditches and utilities.

Excepting therefrom all water rights incident and appurtenant to the above described lands, including those contained in New Mexico State Engineer files RG-1442 thru RG-1449 and RG-1441 thru RG-1450 Comb. X and Comb. X-2.

with warranty covenants.

IN WITNESS WHEREOF, Public Service Land Company, has caused this instrument to be signed by its President and attested to by its Secretary this 30 day of December, 1977.

PUBLIC SERVICE LAND COMPANY,
A New Mexico corporation

ATTEST:

Assistant S Secretary

BY: Robert B Rountree
President

STATE OF NEW MEXICO )
) ss.
COUNTY OF BERNALILLO )

The foregoing instrument was acknowledged before me this 30th day of December, 1978, by Robert B. Rountree, President of Public Service Land Company, a New Mexico corporation, on behalf of said corporation.

NOTARY PUBLIC

My commission expires:
Sept 16 1980

ATTACHMENT 2

NEW MEXICO DEPARTMENT OF GAME AND FISH -- State Capitol -- Santa Fe, New Mexico 87503

file

## AGREEMENT CONCERNING HARVESTING OF ANTELOPE ON LANDS PRIVATELY OWNED OR LEASED FROM PRIVATE LANDOWNERS

This AGREEMENT is made and entered into on June 10, 19[illegible] by and between the New Mexico Department of Game and Fish, hereinafter referred to as "THE DEPARTMENT", and

Robert B. Rountree of [illegible]
(Landowner or Lessee) (Full Mailing Address)

hereinafter referred to as "THE LANDOWNER OR LESSEE".

WHEREAS, it is the desire of both the Department and the landowner or lessee to manage antelope for the herds' welfare, the parties hereby agree to the following with respect to the Rountree Ranch lying within Management Unit No. 52 in Area A- 2.

1. The acreage of the above-named ranch is classified as follows:

| Status | | Acres | Percentage of Total Acres | |
|---|---|---|---|---|
| Private (fee simple) land Owned by rancher | | 23,060 | 100.00 | % fee simple |
| Leased by rancher | | | | |
| Public land leased by rancher: | BLM | — | None | % public |
| | State | — | | |
| | Other | — | | |
| TOTAL | | 23,060 | 100% | |

2. The Department will issue the following total number of antelope licenses for the total acreage shown above - - - - - - - - - - - - - - - - - - - - - - - - - - - 4

The percentage of fee simple land applied to the total number of licenses gives the following number of licenses to be issued as private land licenses applicable to private lands owned or leased by the rancher --- 4

These private land licenses will be issued as 4 paid licenses

and 0 free license

(A free license is authorized only in areas where huntable amounts of public land are involved.)

3. The Department will issue the above private land licenses to applicants who furnish to the Department's Santa Fe office all of the following: (1) completed application Form H, and (2) the appropriate license fee, except in the case of a free license. Private land antelope licenses ARE NOT VALID UNLESS the hunter also has in his possession, while hunting, written permission of the landowner or lessee to use the license on the ranch for which it was issued. This confirmation shall be signed only by one of the following persons:

Robert B. Rountree, Title: owner representative

_______________, Title: of Pub Service Land Co.

Louis Menghert, Title: owner manager and Top-of The World Farms.

4. The landowner or lessee hereby certifies that, in granting written confirmation of permission, he or she will not discriminate among those with whom he or she negotiates for use of the private land licenses on the basis of race, color, religion, sex, or national origin.

5. The private land antelope licenses issued pursuant to this agreement shall be valid only on the private land owned or leased by the landowner or lessee within the hunt area; provided, however, that such licenses shall be valid throughout the total acreage of the hunt area if the landowner or lessee additionally signs the following clause:

   I hereby grant free access to the private land I own or lease within the hunt area, only for the purpose of hunting antelope, to persons who hold antelope licenses valid for the antelope hunt area described above, during the antelope hunt applicable to this area.

   I understand that movements of antelope may cause more or less than the number of public hunters indicated above to be on my private lands during the hunt.

Signed: ______________________________
Landowner or Lessee

6. The landowner or lessee is hereby advised that the following regulations apply to all antelope hunters, including landowners, lessees, holders of private land licenses, and holders of public licenses:

   Reg. No. 583, Chap. 7, Art. 4, Para. 1: "In any antelope hunt for which check stations are established, all antelope hunters shall check in and out in person at the designated check station. Deadline for checking out is 10 p.m. the last day of the season."

   Reg. No. 550, Chap. 5, Art. 2, Sec. 3, Para. 2: "During antelope hunts, no vehicle bearing an antelope hunter may be driven off established roads in the hunting locality, provided, however, that a vehicle may be used to retrieve legally taken and tagged antelope if prior permission is obtained from the landowner and the conservation officer in charge."

7. All agreements become public knowledge and names and addresses of landowners or lessees signing agreements will be made available to the public.

IN WITNESS WHEREOF, the parties have executed this agreement as of the date first written above.

NEW MEXICO DEPARTMENT OF GAME AND FISH

By: ______________________________
Conservation Officer

______________________________
Landowner or Lessee

Phone No.: ______________________________

Copies: Landowner or Lessee
Area Office
Santa Fe Office

RECEIVED
JUN [illegible] 1977
E.C.F.

ATTACHMENT 3

SF-3 SHORT FORM QUITCLAIM DEED—New Mexico Statutory Form—Rev. 2/60

# QUITCLAIM DEED

HICKORY SPINNERS, INC., a North Carolina corporation

for consideration paid, quitclaim to

LOUIS MENYHERT LIMITED, #4, a New Mexico limited partnership

the following described real estate in TAOS County, New Mexico:

Lots 1, 2, 25, 26, 27, 28, Block 1
Lots 24, 25, 26, 27, Block 64
Lots 1, 50, Block 84

In the Sunshine Valley Estates as reflected on the plat filed in Vol. 2, Page 23, records of Taos County, New Mexico.

WITNESS its hand and seal this 9th day of April, 1975

HICKORY SPINNERS, INC.

(Seal) BY: ____________ (Seal)

ITS VICE PRESIDENT

ATTEST:

ITS ASSISTANT SECRETARY (Seal) (Seal)

## ACKNOWLEDGMENT FOR NATURAL PERSONS

STATE OF NEW MEXICO }
COUNTY OF } ss

The foregoing instrument was acknowledged before me this ____ day of ____, 19____,

by ____________
(Name or Names of Person or Persons Acknowledging)

My commission expires:
(Seal)

Notary Public

## ACKNOWLEDGMENT FOR CORPORATION

STATE OF ~~NEW MEXICO~~ NORTH CAROLINA } ss.
COUNTY OF CATAWBA }

The foregoing instrument was acknowledged before me this 9th day of April, 1975,

by Donald L. Cook
(Name of Officer)

Vice President of Hickory Spinners, Inc.,
(Title of Officer) (Name of Corporation Acknowledging)

a North Carolina corporation, on behalf of said corporation.
(State of Incorporation)

My commission expires: 1-6-76

(Seal)

Notary Public

FOR RECORDER'S USE ONLY

STATE OF NEW MEXICO } SS
COUNTY OF TAOS }

This instrument was filed for record on the 6th day of May A.D. 1977 at 2:40 o'clock P.M. and duly recorded in book A-143 Page 238. Rec. 5-12-77

Marie Lorraine Gallegos
County Clerk & Recorder

By Carol Martinez Deputy

THE VALLIANT CO. ALBUQUERQUE, N. M.

ATTACHMENT 4

State of
New
Mexico

Taos
County

TAOS COUNTY ADMINISTRATIVE OFFICES

P.O. BOX 1914
TAOS, NEW MEXICO 87571
505 758 8834

November 20, 1979

Ms. Jean Cantu
Environmental Scientist
Public Service Company of
New Mexico
P.O. Box 2267
Albuquerque, New Mexico 87103

Subject: Top O' the World Exchange
County Road Legal Status

Dear Jean,

In reference to your letter of November 5, 1979, it is my opinion that the legal status of the County maintained roads are those designated in the 1964 inventory.

When a county road is placed on a maintenance inventory, the County is required to provide at least a minimum effort once a year on said road.

If the road is maintained by anyone else, it does not change the legal status of maintenance by the County. Any maintenance should be coordinated with the county as a matter of courtesy.

The Taos County Board of Commissioners is evaluating the possibility of revising and updating the County Road Maintenance inventory. This action is being contemplated being taken at the Regular Monthly meeting in December 1979. If the County approves a new updated inventory, it will then be forwarded to the State Highway Department for review and then to the Department of Finance and Administration for final approval.

I hope you find this information useful in evaluation.

Sincerely,

Allen Vigil

Allen Vigil
Assistant County Manager/Planner

Enclosure

cc: Margaret Lamb, District Attorney

# APPENDIX A

# APPENDIX A

## POTENTIAL FLORA

## SPECIES CHECK LIST, TOP O' THE WORLD RANCH

### POLYPODIACEAE - FERN FAMILY

*Woodsia oregana* - wood fern
*Cheilanthes sp.* - lip fern

### EQUISETACEAE - HORSE TAIL FAMILY

*Equisetum laevigatum* - horse tail

### PINACEAE - PINE FAMILY

*Abies concolor* - white fir
*Pinus edulis* - Colorado pinon
*Pinus flexilis* - limber pine
*Pinus ponderosa* var. *scopulorum* - ponderosa pine
*Pseudotsuga menziesii* var. *glauca* - Douglas fir

### CUPRESSACEAE - CYPRESS FAMILY

*Juniperus communis* - common juniper
*Juniperus scopulorum* - Rocky Mountain juniper
*Juniperus monosperma* - one-seed juniper

### GRAMINEAE - GRASS FAMILY

*Agropyron repens* - quackgrass
*Agropyron smithii* - western wheatgrass
*Agropyron cristatum* - crested wheatgrass
*Andropogon scoparius* - little bluestem
*Aristida fendleriana* - three-awn species
*Bouteloua curtipendula* - side-oats grama
*Bouteloua gracilis* - blue grama
*Elyms canadensis* - Canada wild rye
*Festuca ovina* - sheep fescue
*Festuca thurberi* - Thurber fescue
*Muhlenbergia montana* - mountain muhly
*Muhlenbergia wrighti* - spike muhly
*Oryzopsis hymenoides* - Indian ricegrass
*Phleum alpinum* - alpine timothy
*Poa species* - bluegrass species
*Sitanion hystrix* - squirreltail
*Sporobolus cryptandrus* - sand dropseed

### CYPERACEAE - SEDGE FAMILY

*Carex interior* - interior sedge
*Carex scoporia* - broom sedge
*Carex siccata* - alpine sedge

### LILIACEAE - LILY FAMILY

*Allium cernuum* var. *obtusum* - nodding onion
*Allium geyeri* - star flower
*Yucca* - yucca species

### IRIDACEAE - IRIS FAMILY

*Iris missouriensis* - blue flag iris

### SALICACEAE - WILLOW FAMILY

*Populus tremuloides* - trembling aspen
*Populus wislizenii* - valley cottonwood
*Salix exigua* - sandbar willow

### FAGACEAE - BEECH FAMILY

*Quercus gambelii* - Gambel oak

### POLYGONACEAE - BUCKWHEAT FAMILY

*Eriogonum jamesii* - antelope sage
*Eriogonum* - Eriogonum species
*Polygonum aviculare* - knotweed

### CHENOPODIACEAE - GOOSEFOOT FAMILY

*Atriplex canescens* - four-wing saltbush
*Chenopodium albescens* - small goosefoot
*Chenopodium capitatum* - strawberry blite
*Kochia scoparia* - summer cypress
*Salsola kali* - tumbleweed
*Sarcobatus vermiculatus* - greasewood

### AMARANTHACEAE - AMARANTH FAMILY

*Amaranthus graecizans* - tumble weed
*Amaranthus retroflexus* - pigweed

### NYCTAGINACEAE - FOUR O'CLOCK FAMILY

*Mirabilis multiflora* - four o'clock

### RANUNCULACEAE - BUTTERCUP FAMILY

*Clematis ligusticifolia* - western virgin's bower

### BERBERIDACEAE - BARBERRY FAMILY

*Berberis repens* - creeping mahonia

## APPENDIX A (Cont'd)

CRUCIFERAE - MUSTARD FAMILY
*Arabis sp.* - rockcress
*Erysimum capitatum* - western wallflower

CAPPARIDACEAE - CAPER FAMILY
*Cleome serrulata* - Rocky Mountain bee plant

SAXIFRAGACEAE - SAXIFRAGE FAMILY
*Philadelphus microphyllus* - mock orange
*Ribes cereum* - wax currant

ROSACEAE - ROSE FAMILY
*Cercocarpus montanus* - mountain mahogany
*Fallugia paradoxa* - Apache plume
*Fragaria ovalis* - wild strawberry
*Potentilla spp.* - cinquefoil
*Prunus virginiana* - western black chokecherry
*Rosa woodsii* - rose
*Rubus strigosus* - raspberry

LEGUMINOSAE - PEA FAMILY
*Astragalus spp.* - milk-vetch
*Lupinus spp.* - lupine
*Melilotus spp.* - sweet clover
*Petalostemum spp.* - prairie clover
*Trifolium spp.* - clover

CACTACEAE - CACTUS FAMILY
*Echinocereus vividiflorus* -
*Echinocereus triglochidiatus* -
*Echinocereus fendleri* -
*Opuntia polyacantha* -

POLEMONIACEAE - PHLOX FAMILY
*Gilia aggregata* - red rocket
*Phlox spp.* - phlox

SCROPHULARIACEAE - FIGWORT FAMILY
*Castilleja integra* - Indian paint brush
*Penstemon* - beard tongue

COMPOSITAE - ASTER FAMILY
*Achillea lanulosa* - yarrow
*Artemisia ludoviciana* - Louisiana wormwood
*Artemisia tridentata* - big sage
*Chrysothamnus greene* - green rabbitbrush
*Chrysothamnus nauseosus* - rubber rabbitbrush
*Erigeron spp.* - fleabane
*Leucelene ericoides* - white aster
*Senccio spp.* - groundsel
*Tragopogon pratensis* - meadow goats beard
*Townsendia exscapa* -

# APPENDIX B

## APPENDIX B

## MAMMALS POTENTIALLY FOUND IN OR NEAR THE STUDY AREA

### SORICIDAE - SHREWS

*Sorex cinereus* - masked shrew

*Sorex nanus* - dwarf shrew

*Sorex palustris* - water shrew

### VESPERTILIONIDAE - PLAINNOSE BATS

### LEPORIDAE - HARES AND RABBITS

*Sylvilagus auduboni* - desert cottontail

*Lepus townsendii* - white-tailed jackrabbit

*Lepus californicus* - blacktail jackrabbit

### SCIURIDAE - SQUIRRELS

*Eutamias minimus* - least chipmunk

*Eutamias dorsalis* - cliff chipmunk

*Eutamias quadrivittatus* - Colorado chipmunk

*Spermophilus variegatus* - rock squirrel

*Spermophilus lateralis* - golden-mantled ground squirrel

*Tamiasciurus hudsonicus* - red squirrel

### GEOMYIDAE - POCKET GOPHERS

*Thomomys talpoides* - northern pocket gopher

### HETEROMYIDAE - POCKET MICE, KANGAROO MICE, AND KANGAROO RATS

*Perognathus flavus* - silky pocket mouse

*Perognathus intermedius* - rock pocket mouse

*Dipodomys ordii* - Ord's kangaroo rat

### CRICETIDAE - MICE, RATS, LEMMINGS, AND VOLES

*Peromyscus maniculatus* - deer mouse

*Peromyscus truei* - pinon mouse

*Neotoma albigula* - white-throated woodrat

*Clethrionomys gapperi* - Gapper red-backed vole

### ERETHIZONTIDAE - PORCUPINE

*Erethizon dorsatum* - porcupine

### CANIDAE - DOGS, WOLVES, AND FOXES

*Canis latrans* - coyote

*Vulpes vulpes* - red fox

*Urocyon cinereoargenteus* - gray fox

### PROCYONIDAE - RACCOONS AND COATIS

*Bassariscus astutus* - ringtail

*Procyon lotor* - raccoon

### MUSTELIDAE - WEASELS AND SKUNKS

*Taxidea taxus* - badger

*Mephitis mephitis* - striped skunk

### FELIDAE - CATS

*Lynx rufus* - bobcat

### CERVIDAE - DEER

*Cervus canadensis* - elk

*Odocoileus hemionus* - mule deer

### ANTILOCAPRIDAE - PRONGHORN

*Antilocapra americana* - pronghorn

## APPENDIX B

## AVIFAUNA POTENTIALLY FOUND IN OR NEAR THE STUDY AREA

### PODICIPEDIDAE - GREBES

*Aechmophorus occidentalis* - western grebe

*Podilymbus podiceps* - pied-billed grebe

### ARDEIDAE - HERONS

*Ardea herodias* - great blue heron

*Egretta thula* - snowy egret

*Nycticorax nycticorax* - black-crowned night heron

*Botaurus lentiginosus* - American bittern

### ANATIDAE - WATER FOWL

*Branta canadensis* - Canada goose

*Chen caerulescens* - snow goose

*Anas platyrhynchos* - mallard

*Anas strepera* - gadwall

*Anas acuta* - pintail

*Anas crecca* - green-winged teal

*Anas discors* - blue-winged teal

*Anas cyanoptera* - cinnamon teal

*Anas americana* - American widgeon

*Anas clypeata* - shoveler

*Aythya affinis* - lesser scaup

*Bucephala albeola* - bufflehead

*Oxyura jamaicensis* - ruddy duck

*Mergus merganser* - common merganser

### CATHARTIDAE - NEW WORLD VULTURES

*Cathartes aura* - turkey vulture

### ACCIPITRIDAE - KITES, HAWKS, AND EAGLES

*Accipiter gentilis* - goshawk

*Accipiter striatus* - sharp-shinned hawk

*Accipiter cooperii* - Cooper hawk

*Buteo jamaicensis* - red-tailed hawk

*Buteo swainsoni* - Swainson hawk

*Buteo lagopus* - rough-legged hawk

*Buteo regalis* - ferruginous hawk

*Aquila chrysaetos* - golden eagle

*Haliaeetus leucocephalus* - bald eagle

*Circus cyaneus* - marsh hawk

### PANDIONIDAE - OSPREY

*Pandion haliaetus* - osprey

### FALCONIDAE - CARACARA, FALCONS

*Falco peregrinus* - peregrine falcon

*Falco mexicanus* - prairie falcon

*Falco columbarius* - merlin

*Falco sparverius* - American kestrel

### TETRAONIDAE - GROUSE AND PTARMIGANS

*Centrocercus urophasianus* - sage grouse

### PHASIANIDAE - QUAIL AND PHEASANTS

*Callipepla squamata* - scaled quail

### MELEAGRIDIDAE - TURKEYS

*Meleagris gallopavo* - turkey

### GRUIDAE - CRANES

*Grus americana* - whooping crane

*Grus canadensis* - sandhill crane

### RALLIDAE - RAILS

*Fulica americana* - American coot

### CHARADRIIDAE - PLOVERS

*Charadrius vociferus* - killdeer

### SCOLOPACIDAE - SANDPIPERS AND ALLIES

*Capella gallinago* - common snipe

*Numenius americanus* - long-billed curlew

*Tringa melanoleuca* - greater yellowlegs

*Catoptrophorus semipalmatus* - willet

## APPENDIX B (Cont'd)

## AVIFAUNA POTENTIALLY FOUND IN OR NEAR THE STUDY AREA

*Calidris minutilla* - least sandpiper

*Limnodromus scolopaceus* - long-billed dowitcher

### LARIDAE - GULLS, TERNS

*Larus delawarensis* - ring-billed gull

### COLUMBIDAE - PIDGEONS AND DOVES

*Columba fasciata* - band-tailed pigeon

*Columba livia* - rock dove

*Zenaida macroura* - mourning dove

### TYTONIDAE - BARN OWLS

*Tyto alba* - barn owl

### STRIGIDAE - OWLS

*Otus asio* - screech owl

*Bubo virginianus* - great horned owl

### CAPRIMULGIDAE - NIGHTJARS

*Chordeiles minor* - common nighthawk

### APODIDAE - SWIFTS

*Aeronautes saxatalis* - white-throated swift

### TROCHILIDAE - HUMMINGBIRDS

*Selasphorus platycercus* - broad-tailed hummingbird

*Selasphorus rufus* - rufous hummingbird

### ALCEDINIDAE - KINGFISHERS

*Megaceryle alcyon* - belted kingfisher

### PICIDAE - WOODPECKERS

*Colaptes auratus* - common flicker

*Melanerpes formicivorus* - acorn woodpecker

*Sphyrapicus varius* - yellow-bellied sapsucker

*Sphyrapicus thyroideus* - Williamson's sapsucker

*Picoides villosus* - hairy woodpecker

*Picoides scalaris* - ladder-backed woodpecker

*Picoides tridactylus* - northern three-toed woodpecker

### TYRANNIDAE - TYRANT FLYCATCHERS

*Tyrannus verticalis* - western kingbird

*Sayornis saya* - Say phoebe

*Pyrocephalus rubinus* - vermilion flycatcher

*Contopus sordidulus* - western wood peewee

### ALAUDIDAE - LARK

*Eremophila alpestris* - horned lark

### HIRUNDINIDAE - SWALLOWS AND MARTIN

*Stelgidopteryx ruficollis* - rough-winged swallow

*Hirundo rustica* - barn swallow

### CORVIDAE - JAYS AND ALLIES

*Cyanocitta stelleri* - Steller jay

*Aphelocoma coerulescens* - scrub jay

*Pica pica* - black-billed magpie

*Corvus corax* - common raven

*Gymnorhinus cyanocephalus* - pinon jay

*Nucifraga columbiana* - Clark nutcracker

### PARIDAE - CHICKADEES AND ALLIES

*Parus gambelii* - mountain chickadee

*Parus inornatus* - plain titmouse

*Psaltriparus minimus* - bushtit

### SITTIDAE - NUTHATCHES

*Sitta carolinensis* - white-breasted nuthatch

*Sitta canadensis* - red-breasted nuthatch

*Sitta pygmaea* - pygmy nuthatch

### CERTHIIDAE - CREEPERS

*Certhia familiaris* - brown creeper

### TROGLODYTIDAE - WRENS

*Troglodytes aedon* - house wren

*Thryomanes bewickii* - Bewick wren

## APPENDIX B (Cont'd)

## AVIFAUNA POTENTIALLY FOUND IN OR NEAR THE STUDY AREA

*Catherpes mexicanus* - canyon wren

*Salpinctes obsoletus* - rock wren

### MIMIDAE - THRASHERS AND ALLIES

*Mimus polyglottos* - Northern mockingbird

*Oreoscoptes montanus* - sage thrasher

### TURDIDAE - THRUSHES AND ALLIES

*Turdus migratorius* - American robin

*Sialia mexicana* - Western bluebird

*Sialia currucoides* - mountain bluebird

*Myadestes townsendi* - Townsend solitaire

### SYLVIIDAE - GNATCATCHERS AND KINGLETS

*Regulus satrapa* - golden-crowned kinglet

*Regulus calendula* - ruby-crowned kinglet

### MOTACILLIDAE - PIPITS

*Anthus spinoletta* - water pipit

### BOMBYCILLIDAE - WAXWINGS

*Bombycilla cedrorum* - cedar waxwing

### LANIIDAE - SHRIKES

*Lanius excubitor* - northern shrike

*Lanius ludovicianus* - loggerhead shrike

### STURNIDAE - STARLINGS

*Sturnus vulgaris* - starling

### PARULIDAE - WOOD WARBLERS

*Dendroica petechia* - yellow warbler

*Dendroica coronata* - yellow-rumped warbler

*Dendroica townsendi* - Townsend warbler

*Oporornis tolmiei* - MacGillivray warbler

*Wilsonia pusilla* - Wilson warbler

### PLOCEIDAE - HOUSE SPARROW

*Passer domesticus* - house sparrow

### ICTERIDAE - BLACKBIRDS AND ALLIES

*Sturnella neglecta* - western meadowlark

*Agelaius phoeniceus* - red-winged blackbird

*Euphagus cyanocephalus* - Brewer blackbird

*Molothrus ater* - brown-headed cowbird

### THRAUPIDAE - TANAGERS

*Piranga ludoviciana* - western tanager

### FRINGILLIDAE - FINCHES AND ALLIES

*Carpodacus mexicanus* - house finch

*Carduelis pinus* - pine siskin

*Carduelis psaltria* - lesser goldfinch

*Pipilo chlorurus* - green-tailed towhee

*Pipilo erythrophthalmus* - rufous-sided towhee

*Pipilo fuscus* - brown towhee

*Calamospiza melanocorys* - lark bunting

*Pooecetes gramineus* - vesper sparrow

*Amphispiza bellii* - sage sparrow

*Junco hyemalis* - dark-eyed junco

*Junco caniceps* - gray-headed junco

*Spizella pallida* - clay-colored sparrow

*Spizella breweri* - Brewer sparrow

*Zonotrichia leucophrys* - white-crowned sparrow

*Zonotrichia atricapilla* - golden-crowned sparrow

*Melospiza melodia* - song sparrow

# APPENDIX B

# AMPHIBIANS, REPTILES, AND FISH POTENTIALLY FOUND IN OR NEAR THE STUDY AREA

## AMPHIBIANS

### AMBYSTOMIDAE - MOLE SALAMANDERS AND RELATIVES

*Ambystoma tigrinum nebulosum* - Arizona tiger salamander

### PELOBATIDAE - SPADEFOOT TOADS

*Scaphiopus bombifrons* - plains spadefoot

### BUFONIDAE - TRUE TOADS

*Bufo woodhousei woodhousei* - Rocky Mountain toad

### RANIDAE - TRUE FROGS

*Rana pipiens* - leopard frog

## REPTILES

### IGUANIDAE - IGUANIDS

*Sceloporus magister* - desert spiny lizard

*Sceloporus undulatus tristichus* - southern plateau lizard

*Sceloporus graciosus graciosus* - northern sagebrush lizard

*Phrynosoma douglassi ornatissimum* - desert short-horned lizard

### SCINCIDAE - SKINKS

*Eumeces multivirgatus epipleurotus* - southern many-lined skink

### TEIIDAE - WHIPTAILS AND ALLIES

*Cnemidophorus velox* - plateau whiptail

### COLUBRIDAE - COLUBRIDS

*Pituophis melanoleucus affinis* - Sonora gopher snake

*Lampropeltis triangulum celaenops* - New Mexico milk snake

*Thamnophis sirtalis ornata* - New Mexico garter snake

*Thamnophis elegans* - western garter snake

*Thamnophis cyrtopsis* - black-necked garter snake

### VIPERIDAE - VIPERS

*Crotalus molossus* - black-tailed rattlesnake

*Crotalus viridis viridis* - prairie rattlesnake

## FISH

### SALMONIDAE - SALMON (TROUT)

*Salmo clarki* - cutthroat trout

*Salmo gairdneri* - rainbow trout

*Salmo trutta* - brown trout

### CATOSTOMIDAE - SUCKERS

*Catostomus commersoni* - white sucker

### CYPRINIDAE - MINNOWS

*Rhinichthys cataractae* - longnose dace

*Notropis jemezanus* - Rio Grande shiner

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